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The Farmer's Digest

Volume 5 December, 1941 Number 8

Houses from the Land

Condensed from Free America

Oren Stephens

ONE day early in 1937 two reports, which were destined to have a far-reaching influence upon the farmers of Arkansas, came to the desk of Daniel T. Gray, then dean of the University of Arkansas College of Agriculture and director of the Agricultural Extension Service. The first was the report of the President's committee on farm tenancy, which prompted Mr. Roosevelt to describe the South pungently as the nation's foremost economic problem, a region whose people were ill-fed, ill-clad, ill-housed. The second was the report of the 1936 cash income of Arkansas farmers.

Long interested in the problem of rural housing, Dean Gray decided, after reading the report of the President's committee, that action was long overdue. Yet at the same time the low cash earnings seemed to preclude positive action. It was obvious that as long as they remained so low, farmers could not materially improve their housing through established building practices. Perhaps, though, they could adopt some new practice. After Dean Gray had thought about this for a couple of months, an idea was born.

It was a good idea. As a result of it, the independent, small-farm owners of Arkansas have, in a little more than four years, gone far toward removing the stigma of poor housing. Nearly 15,000 farm families, most of them with holdings of from 20 to 80 acres, have moved into new, modern, well-built, attractive farm homes with an estimated total value of about $22,500,000. While these new houses have an average value of $1,500, they have been built with an average cash outlay of about $500, and at savings ranging generally from 25 to 75 per cent of what they would have cost if built commercially. And most important of all, the houses are debt free.

The amazing size of this better-

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homes campaign is revealed by the fact that there are, according to the 1940 census, only 85,842 farm owners of all types in the state, with holdings valued at a little less than $200,000,000. Though preliminary Census reports do not show how many of these farms are owned by small operators, agricultural authorities estimate that perhaps a third of the farmers for which the plan was projected have participated in it. Estimates of how much they have increased the value of their improvements run almost as high.

Dean Gray's idea was no gigantic rural housing project subsidized with federal funds. Money was, in fact, the thing the project had the least of when it was launched in April, 1937. It was instead a "homemade homes" project which, while adapted to fit today's conditions, merely took a leaf from the book of the pioneers who through necessity built their houses with the materials at hand. For it occurred to Dean Gray that while Arkansas farmers had a low cash income, Nature had blessed them with other things, including a wealth of basic building materials available free of charge for homemaking purposes.

"In looking about us," he said to associates as the idea began to take definite form, "we find we have been given stone, gravel and timber in abundance. All the farmers need to do is to use their intelligence, their muscles and their artistic ability in bringing these materials together in the shape of homes."

Yet he well knew this would never be done unless the farmers had sane and determined leadership, and to the college's Extension Service workers he assigned this task. To carry out the program he had in mind, he named a committee composed of Deane G. Carter, then professor of agricultural engineering; Miss Connie J. Bonslagel, state home-demonstration agent; Mrs. Ida Fenton, extension economist in home management; Elbert Carnes, extension engineer, and C. C. Randall, then assistant director of the Extension Service.

This committee, making a careful survey of the situation, found that forest products were available throughout the state and that stone suitable for building purposes was available in 55 of the 75 counties. Equally as important as materials, they realized, would be the initiative of the farmers. Would they be willing to pay in toil for what they could not pay in cash? After studying the accomplishments of farmers who already had built new houses without benefit of organized aid, they concluded the initiative was there, though for the most part dormant. Architectural and engineering calculations, plus

construction of some model homemade homes on the college's experiment farms, further indicated it would be possible to substitute materials and labor for as much as two-thirds of the normal cash outlay.

Convinced the plan was practicable, they commissioned an architect to design a number of model farm homes adapted to the available building materials. To these were added designs for barns, poultry houses and other necessary out-buildings. Inexpensive lithoprints were made of the designs for distribution to prospective home builders who, when they selected the desired design, could then obtain the blueprints at a nominal cost of 10 cents a sheet.

Adequacy of shelter and utility of design were the first requirements of the plans. After these had been satisfied, the architect could concentrate on attractiveness. There are about 125 plans in the series. A third of them are houses, two-thirds are other farm structures. The house plans make use of frame, log, and stone construction.

In providing the plans, the committee took cognizance of the fact that even the best farmers would not necessarily be able to plan a satisfactory house. Fortunately, they also realized the farmers would not necessarily be able to build the houses after plans and blueprints had been provided. Consequently, extension specialists, aided by county and home-demonstration agents, conducted housing schools throughout the state. Farmers attending were taught how to select designs best fitted to their special needs, or how to revise the designs if there were none that fitted a particular family situation. This called for instruction in proper room arrangement, adequate ventilation, water and sewage facilities, and interior decoration. Since most of the farms had woodlands, farmers were taught the fundamentals of forest management, including the selection and treatment of trees to be lumbered, or to be used as building logs. Where building stone was available, instruction was given in how to select and cut stone.

Finally, the farmers were schooled in carpentry and masonry. First they learned to read blueprints. Then they were taught construction with stone or logs or lumber. For log and lumber construction there was already a rudimentary knowledge, and extension specialists found that stone masonry was comparatively easy to teach. Since the stone-laying started in hidden foundations, they found that by the time the farmer-masons reached the visible parts of the walls, they had mastered the

technique and were turning out work that would have done credit to professionals.

Some materials had to be bought. For this reason building material dealers throughout the state were provided with copies of the plans so they could advise the farmers in selection of hardware, millwork, plumbing fixtures, electrical wiring, and the like. This, plus the necessity in many instances of employing some skilled labor, accounted for the major portion of the cash outlay. Yet even here, many farmers built houses almost without cash. If complete sawmills were available, farmers exchanged timber for the finished products. And hundreds of small, portable, tractor-powered sawmills cut lumber for them on a share basis.

Plans and materials and building ability had been provided. There was now the last and most important thing on which the whole plan hinged—work. Building a house is no small task. Unskilled workers, using only their spare time, require months to do the job. Would they see it through? Fifteen thousand families have, and this means many more individuals, for all members of the family have done their share. For the most part wives and daughters have done the lighter construction work and have taken care of interior decoration, but it must also be said that thousands of them have become as efficient with hammer and saw as with sewing machine and cook stove.

Conditions on Arkansas farms are ideal for spare-time construction work. After crops are "laid-by" in the summer, and before harvest in the fall, there are several weeks available. But most important of all is the winter period when farm work is light but when, thanks to a comparatively mild climate, outdoor work is possible probably 90 per cent of the time.

The 15,000 farmhouses that have resulted from this program are not mansions. They have four, five and six rooms, usually, and in only a small percentage has the value exceeded $2,000. On the other hand, they are a far cry from the dilapidated shacks that have given rural housing, especially in the South, such a black eye. Aside from being well-designed and well-built, they have more attractiveness than one would imagine possible at such low cost. This is particularly true of log houses. Stone houses also are especially attractive.

While some houses built under the plan have required a cash outlay of less than 10 per cent, extension workers have discouraged such extreme savings, persuading most builders to accept a smaller saving in return for added conveniences and modern

equipment. A surprisingly large number are equipped with electricity, automatic water systems, sewage disposal facilities, and the like.

A study of 200 typical houses, with an average value of $1,575, revealed this distribution of costs: employed labor, $176 or 11.2 per cent; contributed labor, $344 or 21.8 percent; purchased materials, $524 or 33.2 per cent; farm-supplied materials, $531 or 33.8 per cent. Extension officials estimate, however, that the average cash expenditure on the 15,000 houses has not exceeded $500.

It was found that in general the builders spent in cash about the equivalent of a year's cash income. In computing the financial status of these farm families, it must be remembered, however, that cash income does not provide an accurate measure. For these are live-at-home farm families whose cash expenditures are therefore low. They grow cotton, corn and truck crops, and raise livestock for a cash return, but equally important, if not more so, in their scheme of living is the production system used on the farms. A visitor at these homes invariably finds, for example, a large pantry whose shelves sag under the weight of canned foods, and smokehouses filled with home-raised and home-cured meats. If their cash income in any given year is, say, $750, it's a safe guess that their production-for-use is equally as valuable.

Their solution to the housing problem is not, of course, a solution to the South's housing problem in general. They are the independent owners of small and medium farms. The plan was designed to fit their conditions. It does not, for instance, help the thousands of tenants and sharecroppers who have no incentive to build new houses or even to improve their present ones. Nor does it contribute anything toward a solution of urban housing problems.

Yet to that very important group for which the plan was conceived, it has demonstrated that it is the most satisfactory means yet found for substituting farm homes for farm shacks.

Streamlined Pork Production

Condensed from The Farmer

H. L. Harris

Extension Editor, University Farm, St. Paul

NELSON BROTHERS have "streamlined" hog raising. Noteworthy not only for size, simplicity and efficiency, Nelson's hog operations are just different enough so that they never fail to start hog men off on a lively debate. The Nelsons—Robert J. and Walter H.—farm 520 acres in Redwood County, nine miles from Tracy, Minnesota.

Last year they produced eight times as much pork as the average for the 165 farms in the Southwestern Minnesota Farm Accounting Route to which they belong. Their 553 pigs made 100 pounds of pork from 355 pounds of grain feed and concentrates compared with an average of 488 pounds for all farms in the group. Including pasture, the feed cost per hundredweight was $3.14 for Nelsons, $4.29 for the average. For each $100 worth of feed used, Nelsons' hogs returned $174, the average return for the 165 farms being $137, despite the fact that Nelsons took an average net price of only $4.74 for their hogs against $5.15 for the average.

There's a reason behind that difference in selling price, but before going into further detail, let's look at the highlights of the Nelson plan and get a bird's-eye view of how it runs through the season. Rather, we might say, "through the year" because the Nelsons take 11 months getting their hogs to market. Right here is where most good hog men are inclined to shake their heads and dismiss the subject, but the Nelsons' figures don't brush away easily. They were carefully kept under the supervisoin of a University of Minnesota fieldman and former county agent and have been checked and studied by farm management authorities at University Farm.

What's so "streamlined" about a plan that takes 11 months to grow a hog? you ask. To answer that one, merely shift your thinking into terms of pork instead of pigs. Half the explanation for that 11 months is carrying the pigs along slowly through the summer and fall—the other half is feeding them to a 375-pound average.

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The farm records don't provide figures on labor and equipment costs, but there is evidence that they were remarkably low. The two brothers, plus one hired man and Robert's 17-year-old son, did all the work on Nelsons' 520-acre farm last year, growing 144 acres of corn, 178 acres of barley and 119 acres of flax and feeding out two carloads of beef cattle in addition to raising 553 hogs, or rather 88 tons of pork on the hoof.

The Nelsons raise only spring pigs and have them farrowed on pasture which allows for important short cuts in the sanitation necessary to dodge worms and necro.

When the writer visited the Nelson farm early in June, these pigs and their dams were scattered all over 22 acres of sweet clover pasture, a half mile out from the buildings. There they were to remain until fall. At 8 weeks of age they were to be weaned, then vaccinated for cholera, while the sows would go to the feed lot for fattening. Before weaning, the pigs were being creep fed, but after weaning the pigs were to loaf along on pasture, with just enough grain to keep them thrifty. They figure not less than two pounds of grain per 100 pounds live weight per day for this purpose. After threshing was over, the pigs were to move into the barley stubble. This fall they may hog off some corn, and finally will clean up after the corn picker, garnering every morsel of feed and forage available on a hog-tight half section. Full feeding will not commence until December 1, though after the middle of October the pigs will come home to the barn and sheds for water and shelter.

Through December, January, February and March, these pigs will be crowding the self-feeders and making 375-pound hogs of themselves ready for the April market upturn.

Sanitation is streamlined like the rest of the practices to economize on labor. The clean, open fields, floorless cots and fresh straw avoid the cleaning measures necessary in an old hog house. They do not wash their sows, and the fact that the pigs do not become infested from nursing would seem to indicate that there are not many worms left. Sows are bred to begin farrowing about the first of May, by which time the sweet clover pasture is well grown. Beginning about the middle of April, as sows become heavy with pig, they are moved out to pasture in batches at least a week before farrowing time. If results are any indication, the system works, for there has been no serious trouble with worms or any filth diseases.

The pasture is divided into two or three parts to separate the

younger pigs from the older ones. They feel that pigs or litters more than ten days different in age should not be kept together because of robbing and other difficulties. For farrowing quarters, they have 40 small A-shaped cots and scatter them all over the 22 acres. A sow will select a cot for farrowing, then after a few days move her pigs to common sleeping quarters nearer the feed and water supply. By that process each cot will farrow two or more litters. This year with 105 sows using the 40 cots, there was just one case in which two sows used a cot together. Both saved big litters and no harm resulted. The Nelsons use lots of bedding in the cots, building up the straw until it is about six inches deep; otherwise they say the pigs are subject to rheumatism. The cots are placed on slightly raised locations in the field to avoid having water run underneath.

The cots are 5 x 6 feet at the bottom, the sides being built on 2 x 6's. The A-shape of the cots makes guard rails unnecessary.

Pigs are creep-fed on some commercial concentrate just as soon as they will eat, and up until weaning both sows and pigs are hand-fed corn from a wagon.

After the sows have been taken up for fattening, the pigs are fed corn from a wagon, supplemented with some protein—usually one part tankage to three parts soybean meal—in small amounts, just enough to keep them thrifty. The Nelsons feed largely by eye, watching the pigs closely, but aim at not less than two pounds of grain per 100 pounds live weight, this being the minimum feeding necessary to keep the pigs thrifty on good pasture. A home-mixed mineral, 40 parts lime, 40 parts bone meal, 20 parts salt, is self-fed, and water is provided from stock tanks with drinking fountains.

To haul water out to the pigs, the Nelsons have a 350-gallon tank mounted on an old auto chassis which makes a trailer that can be hauled out behind the family automobile or with a tractor.

Shade and shelter are provided in two ways. In addition to several open shelters mounted on posts, they improvise shelters from the farrowing cots. A low rail is set up on posts running east and west. The cots are propped up on this rail, side by side, leaning toward the south, making a long row of shade on the north side. Staked firmly in place these tipped-up cots furnish excellent shelter as well as shade. Supplementing the tipped-up cots for shade are four 5 x 16-foot shelters and one that is 16 x 48 feet.

After foraging until December first, the pigs are shut up and worked onto a full feed of corn,

supplemented by a tankage mixture. They have a large two-part self-feeder, much like a double corn crib with a cement platform between. The feeder has a capacity of about 1,100 bushels and each part feeds from both sides, so there are four feeding troughs 24 feet long, on a good concrete floor. A small section of the self-feeder is partitioned off for the protein mixture. The pigs remain on full feed until about the first of April when the Nelsons usually expect a peak in the spring market price. By that time the hogs will weigh around 375 pounds and are marketed over a period of two or three weeks; the heavier ones being sorted out and sold first.

It was this April marketing and the heavier weights of their hogs which account for the Nelsons taking a lower price for their hogs last year than the average for the 165 farms, as mentioned at the beginning of this article.

For winter shelter, the Nelsons have a large, double shed near the feeder and hogs also use a part of the barn in which is provided a self-watering tank.

About January 1, a month after they have placed their pigs on full feed, they sort out the gilts for breeding, picking the largest and best. These gilts are then placed in separate quarters and bred. Having been on full feed for about 30 days, they are gaining fast and thoroughly flushed, which the Nelsons believe is a big factor in the large litters they are consistently able to get. During the winter the sows are fed a ration built mainly on about five pounds of corn per head per day, supplemented with ground alfalfa hay—a half to three-quarters of a pound—and about three-fifths of a pound of protein supplement consisting of one part tankage and two parts soybean meal. Sometimes barley may be used to replace a part of the corn. The regular mineral mixture is also provided.

The Nelsons raise crossbred hogs of Duroc and Hampshire breeding, alternating with boars of these two breeds. They buy purebred boars from breeders with herds that average nine pigs or more to the litter. From this combination of selected boars and thrifty, well-flushed gilts they uniformly get good litters.

University Farm extension specialists, S. B. Cleland in farm management and H. G. Zavoral in animal husbandry, have the following to say, "Many of the features used on this farm we can heartily approve; others we are watching with interest. The way the Nelsons handle large numbers of hogs with a minimum of labor, is suggestive of many worth-while practices. Their liberal use of pasture on clean ground each year appears to be very desirable.

Their breeding and farrowing methods, their small expense for equipment, and their attention to the details of water and shade, minerals and protein, and vaccination, are all good. On the other hand, their practice of delaying heavy feeding until the pigs are at an age when hogs on many other farms would have gone to market differs sharply from what has been considered good practice. The records of results obtained are impressive; we will watch with interest to see whether in the long run the Nelsons will continue to hold the advantage in the economy of feeding and financial returns as compared with other good hog producers. Thus far the figures seem to support their program."

New Source of Vitamin D

Discovery of a wholly new source of Vitamin D is announced by the Du Pont Company.

It is said that the discovery will make the American poultry industry permanently independent of Vitamin D imports, now virtually shut off by disturbed world conditions.

Du Pont research on Vitamin D started more than ten years ago, soon after Prof. Steenbock at the University of Wisconsin discovered that certain sterols or chemical compounds could be converted by irradiation with ultra violet light into an effective source of Vitamin D. After it was found that irradiated sterols of plant origin were not effective for poultry, Du Pont scientists located sterols of animal origin that could be irradiated to supply vitamin D to poultry.

Further search for domestic sources of these sterols plus the development of chemical processes followed, and today production of a new and better source of Vitamin D on a scale large enough for present and future needs is assured, says the company.

The company stated that this new Vitamin D has been defined as "D"-Activated Animal Sterol by the American Association of Feed Control Officials. It will be known as "Delsterol."

—*N. J. Farm and Garden*

Cattle and Sheep Manufacture Their Own B Vitamins

Condensed from The Cattleman

Dr. P. B. Pearson

Professor of Animal Husbandry, A. & M. College of Texas

UNTIL very recently little attention has been given to the role of the various members of the vitamin B-complex in the nutrition of cattle and sheep. It is certainly important to know which vitamins need to be furnished in the rations of these animals. During the past decade considerable has been written about the necessity of providing our farm animals with feeds that supply adequate amounts of carotene or provitamin A. It would seem to be of economic importance to know whether or not other vitamins that are lacking in some of our common feeds are required by cattle and sheep.

The vitamin B-complex comprises a rather large family of vitamins. At least five members of this family of vitamins have now been identified chemically and are available in pure form. The better known members of the vitamin B-complex are B_1 or thiamin, riboflavin, nicotinic acid, pantothenic acid and pyridoxine. It has now been demonstrated that all of these vitamins must be provided in the rations of pigs and all of them except nicotinic acid are required by poultry.

During the past three years investigations have been conducted by four different institutions to determine whether or not the various vitamins of the B-complex are necessary for cattle and sheep. Since ruminants have a different type of digestive system than other classes of farm animals there was some basis for suspecting that the requirements of cattle and sheep for members of the vitamin B-complex might differ from those of other species. This problem has been studied by the Department of Animal Husbandry and the Division of Veterinary Science of the Texas Agricultural Experiment Station, the University of California, University of Wisconsin and the Ohio Agricultural Experiment Station. The problem has been approached from different angles by these institutions, but in general the same results have been obtained.

Reprinted from The Cattleman, October, 1941

Three different types of experiments were conducted. First young animals were fed a ration which was known to contain only negligible amounts of the particular vitamin or vitamins being studied. The growth of the lambs and calves on this ration was then compared with the growth of comparable animals on a well balanced ration. A second method has been the use of a rumen fistula. This is an opening that is made directly into the rumen or large stomach. After the animal has recovered from this operation one can then reach into the rumen and obtain the ingested feed at various periods after it has been consumed. The rumen contents are then assayed for the vitamins either by chemical or biological methods. A third method that has been used is to collect the urine and determine the amount of the various vitamins that it contains. Provided the urine contains liberal amounts of a vitamin it indicates that this vitamin is being manufactured in the animal's body. Likewise, if the rumen contents are found to contain substantially more of the vitamin than was present in the feed it indicates that the vitamin is being manufactured in the rumen.

Weanling lambs were fed a ration which contained only minor amounts of the various members of the vitamin B-complex, especially of nicotinic acid, riboflavin and pantothenic acid. Such a ration with the undigestible cellulose or fiber omitted is entirely inadequate for pigs, chickens or dogs. However, when the lambs were fed this ration they made an average daily gain of 0.28 pounds over a 90-day feeding period. In fact the gains were no better when dry yeast, which is a rich source of nearly all members of the vitamin B-complex, was included in the ration.

Studies made on the feed taken from the rumen after the sheep were killed furnished further evidence that the B vitamins are not necessary for this species. In the case of cattle the ingested feed was removed from the large stomach through the rumen fistula several hours after the animal had been fed. The feed thus obtained from the rumen of cattle and sheep was assayed for its content of the various B vitamins. The results of these assays showed that on a dry basis the rumen contents contained about 10 times more thiamin or B_1 than did the ration. For the other vitamins the increases were riboflavin 44, nicotinic acid 5, pantothenic acid 16, and pyridoxine 7 times that of the feed that was consumed.

In the case of cows producing milk it was found that the milk contained liberal amounts of some of the vitamins that were

lacking in the feed. With some of the vitamin, especially riboflavin, the amount secreted in the milk exceeded by several times the amount that was furnished by the feeds. Further evidence proving that cattle and sheep do not require various members of the B-complex was gained by analyzing the urine of animals on a deficient ration. In the case of all the vitamins studied from this angle it was found that there was essentially as much in the urine when the animals were on a deficient ration as when they were receiving a ration that supplied a liberal amount of the various vitamins. Obviously this would not have been the case unless the vitamins were being manufactured somewhere in the animal's body.

In addition to the vitamins previously mentioned it may be of interest to know that vitamin K, which is necessary for the clotting of blood, and biotin or vitamin H, which is necessary for chickens, are also manufactured in the body of sheep and cattle.

Speculation naturally arises as to the mechanism whereby cattle and sheep are able to produce for themselves many of the vitamins that must be furnished in the food of man and other animals. In cattle and sheep and other ruminants such as the deer the rumen or first stomach is very large. In cattle the rumen has a capacity of from 25 to 30 gallons and the feed may remain in this part of the stomach from two to three days. The time that it stays in the rumen of sheep is somewhat less.

There are millions of bacteria present in the rumen where they play an essential role in digestion. They aid in breaking down the fibrous part of the feed. A second important function of these bacteria is the synthesis or manufacturing of certain new compounds, including these B vitamins. These vitamins which are produced in the rumen by the bacteria are then available to the animal as in any feed that is eaten. They pass on through the various compartments of the stomach and into the intestine where they are absorbed into the blood stream. They are then distributed to the various organs and tissues in the body where they serve the same functions that they do in any other animals.

Strictly speaking the B vitamins are required by ruminants, but the important point is that nature has made provisions for the manufacture of these vitamins in the animal's body. Thus we may say that the various members of the vitamin B-complex are not dietary essentials for ruminants and, consequently, they do not need to be supplied in the rations for cattle and sheep.

The Effect of Shark-Liver Oil on Vitamin A Content of Milk and on Milk Production

Condensed from Certified Milk

Professor H. J. Deuel, Jr.

Department of Biochemistry, University of Southern California, School of Medicine

FOR a number of years it has been recognized that a seasonal variation in the vitamin A content of milk and butter fat occurs. The highest values in vitamin A occur coincident with the periods when the cows receive the fresh green feeds which are high in the provitamin A, carotene. Thus, the average layman has been led to believe that the nutritive value of milk (as far as vitamin A is concerned) is in direct proportion to its yellow color.

That this relationship of color and total vitamin A content does not always hold is evident from the experiments of Baumann, Beeson, and Rupel who showed that different breeds of cattle produce milk with a marked variation in amount of carotene although the total quantity of available vitamin A does not differ greatly. The Guernsey whose milk contains more carotene than the Holstein, has a smaller amount of the colorless vitamin A than is found in the milk of the Holstein.

The attempt to increase the quantity of vitamin A to higher than the normal summer levels by the feeding of additional carotene has met with only partial success. The ability of the cow to absorb the carotene seems to be one limiting factor while there appears to be some question as to the effectiveness in the mechanism for the transformation of large quantities of the provitamin A to vitamin A in the animal organism.

The administration of large amounts of vitamin A as a method for increasing the amount of this vitamin in the milk has also met with practical difficulties. Cod-liver oil, which has been used as the source of vitamin A, unfortunately possesses a toxicity when fed in large amounts which results in decreased fat production. The results which we are going to report indicate that the quantities of oil necessary in the feed to produce an augmentation in vitamin A in the milk would have to be very large when sources with as low potency in

Reprinted by permission from Certified Milk, 1265 Broadway, N. Y. C., Oct., 1941

vitamin A as cod-liver oil are employed.

In the present investigation the effect of the addition of relatively small amounts of shark-liver oil to the diet of Guernsey cows has been studied both from the standpoint of the vitamin A content of the milk and from that of total milk and butter fat production. Shark-liver oil possess a potency much higher than cod-liver oil, relatively weak oils such as we employed having a strength of 25,000 International Units of Vitamin A per gram or about 30 times the value of minimum standards of medicinal cod-liver oil. The shark-liver oil contains very low levels of vitamin D; consequently its administration in large amounts need not bring about toxic symptoms from an overdosage of vitamin D.

The first series of tests were carried out on 12 Guernsey cows of a Certified herd from August 4, 1940, to February 12, 1941. These animals received fresh cut alfalfa daily as well as grain supplements up to early December, when the fresh alfalfa was replaced with cured alfalfa. The total milk produced during the period of the test was determined by weighing the milk at each milking. During a preliminary basal period of five weeks as well as during the second, third, ninth and sixteenth weeks after the start of oil feeding to a part of the group, a representative sample of the week's milk produced by each cow was obtained by mixing aliquot samples saved from each of the 14 milkings during the week. The total fat was determined on the representative mixed sample; as well as the carotene and vitamin A on the butter fat obtained from it.

During a period of 9 weeks following the basal period, 30 c.c. of sharkliver oil with a potency of 25,000 International Units of vitamin A per gram was fed to 6 cows daily while the other 6 cows received the same basal diet without the addition of the oil supplement. Thus, the additional amount of vitamin A ingested was approximately 700,000 units daily.

At the beginning of the eleventh week the dose of shark-liver oil was doubled with 3 cows to 60 c.c., 3 cows continued to receive the 30 c.c. level while the 6 control cows continued on the basal diet as before. One control cow as well as one cow on the double dose continued for one and two months longer respectively (19th and 23rd weeks).

It will be noted that the basal diet was of such high quality as to produce in itself butter having an average of between 33 and 55 International Units of vitamin A per gram of butter fat. In spite of this initial high level it was possible to increase the quantity

of vitamin A by the administration of 30 c.c. of the shark-liver oil daily, to values between 62 and 72 units per gram while the average of 3 cows receiving 60 c.c. of this supplement was 113 units in the 16th week. On the 19th week one cow produced a butter fat having 170 units of vitamin A per gram and exactly the same value was found for the butter fat from this cow one month later.

The values were determined with the electronic photometer but the vitamin A content of the highest and lowest samples was confirmed by bioassay on rats.

The administration of 10 c.c. and 20 c.c. of shark-liver oil in a second series of 6 cows did not appreciably alter the vitamin A content of the milk. Apparently the increased excretion in the milk does not start until the threshold limit is exceeded, which is somewhere in the neighborhood of 700,000 units per cow per day.

A marked increase in milk production occurred promptly when the administration of shark-liver oil was started.

Although the average weekly milk production of the oil-fed and control cows was practically the same during the preliminary basal period, the seasonal drop continued thereafter with the control group while an icrease over the basal level continued for 4 weeks in the cows receiving shark-liver oil. The milk production continued at approximately a 10 per cent higher level during the 16 weeks of the tests.

Along with the increase in milk production, a rise in the butter fat was found. The cows receiving the supplement of shark-liver oil excreted an amount of butter fat higher than noted in the basal period while a decline was noted in the control cows. The increased production of the A-fed cows as compared with the control animals was 597, 578, 497 and 794 grams respectively on the 2nd, 3rd, 9th, and 16th weeks after the initiation of the tests.

Although it is recognized that such factors as feed, season, and period in the lactation cycle influence the quantity and butter fat content of milk, there seems to be sufficient evidence that these

TABLE II

The Average Butter-fat Percentage in Representative Weekly Samples of Milk

	Butter-fat in Per Cent								
	Basal Period					Experimental Period			
Groups of 6 Cows	8-5	8-12	8-19	8-25	Avg.	9-16 (2nd wk.)	9-23 (3rd wk.)	11-4 (9th wk.)	12-16 (16th wk.)
Control	4.4	4.4	4.5	4.7	4.5	4.6	4.9	5.3	5.5*
Experimental	4.1	4.1	4.2	4.3	4.2	4.4	4.6	4.9	5.4

*5 Samples only

conditions are not the cause of the variation between the two groups reported here. The basal diet given to the cows although somewhat altered toward the end of the experiments, was identical throughout for the two groups. The total fat fed as a supplement to the experimental group of cows was only slightly over one-third of the amount of increased production of butter fat. In as much as all of these tests were conducted concurrently, any alteration due to season would effect the groups similarly. Lastly, the average date for the last calving of the six animals in the control and oil-fed groups were the same although the average date at which the oil-fed cows were bred was about two months later than the date for the control animals.

The fact that a sharp rise in milk production occurs immediately in the oil-fed group, while the regular periodic decline continues in the control group would also indicate that the variation must be a dietary one rather than due to a variability in lactation cycle where a slow change would be expected.

That the shark-liver oil possessed no toxic properties similar to that of cod-liver oil which results in lowering of percentage of butter fat is shown by Table II.

There was no taste of the fish-liver oil passed into the milk.

In conclusion one may definitely state that the administration of shark-liver oil in quantities of 700,000 International Units or over per cow per day has been shown to result in increased vitamin A in the butter fat. In one case in the present experiments a value as high as 170 units per gram was found. This augmented excretion of vitamin A was demonstrated to continue as long as 23 weeks during which the vitamin supplement was fed.

The increased vitamin A is largely in the form of vitamin A rather than as carotene. In fact there seems to be a suppression in carotene excretion. The butter with the highest content of vitamin A was almost without color. It is therefore evident that color is not necessarily an index of the potency of a milk in vitamin A. The administration of the shark-liver oil was accompanied by a rise in total milk and butter fat production which exceeded 10 per cent. This augmentation continued for at least 16 weeks during which the experiments were continued.

This experimental study was carried on in the Department of Biochemistry, University of Southern California School of Medicine, under the direction of Professor H. J. Deuel and with the collaboration of the Los Angeles Medical Milk Commission. It was made possible

through a grant from the California Packing Corporation who also furnished the shark-liver oil. We are also indebted to Adohr Milk Farms for their co-operation in carefully controlling the animal group and the collection of milk samples.

Our Commission wishes to add to this paper the opinion that the supplementary feeding of vitamin A to dairy animals will prove of distinct advantage to both consumer and producer. Shark-liver oil has proven a practical and economical source of Vitamin A for this purpose. Evidence so far seems to justify the statement that the cost of oil necessary is more than offset by the material advantage gained. What the possibilities may be of benefit to the general condition of the animal herself is yet to be determined.

New Spray for Apples

Condensed from Kansas Farmer

COMMERCIAL apple growers will be interested in a new spray formula that is claimed to be more effective in the control of codling moth than anything else that has yet been tried. Information on this new compound has just been released so that growers who wish to do so may plan to use it in their 1942 spray program.

The new material is a bentonite-arsenical compound that has had 5 years of experimental use and is said to be so far ahead of the usual arsenate of lead, lime oil and nicotine sprays that there is no comparison. In an experimental orchard where a calyx spray and only 2 cover sprays of the new formula had been applied, a check on August 1 on 9 different apple varieties showed less than 1 per cent worms and stings as compared with 5 to 10 per cent worm damage where 6 applications of arsenate of lead had been applied.

Apples sprayed with the new bentonite-arsenical spray showed consistently better color and finish. There was a good reason for this. When as many as 9 to 11 applications of arsenate of lead and lime are made, both apples and foliage become covered with a heavy coating of these opaque materials. This shuts out the sun's rays and retards photosynthesis — the starch-making process—in the leaves. The result is poorly-colored fruit. Even with these heavy and frequent applications of the standard spray materials, worms are not successfully controlled and there is a residue left on the fruit that is difficult to remove at harvest time.

Reprinted by permission from the Kansas Farmer, October 18, 1941

The new bentonite-arsenical spray may be applied late in the season to control 3rd and 4th brood worms without danger of excess residue at picking time on the late varieties. Its greater effectiveness is due to the fact that it contains more arsenic than arsenate of lead, yet it does not burn the foliage or russet the fruit because the bentonite clay acts as a buffer or safety valve for the arsenical. Its cost is said to be no greater than arsenate of lead.

There is every indication that a part at least, of our apple export trade will be regained. It is said that 5,000,000 bushels of this season's crop will be dehydrated and shipped to England. A recent news item states that 2,100,000 bushels of apples have been purchased from Canada by Great Britain. The English people have long held the apple in high regard as a valuable health-preserving food.

The importation of American apples into England dates back to the reign of Queen Victoria when the American ambassador to the Court of St. James was a gentleman from Albemarle county, Virginia. He had several barrels of the Albemarle Pippin sent to him from home. He courteously presented some of these to the new Queen, and she was so delighted with the quality and flavor of the fruit that from that day in 1837 up until a few years ago this country enjoyed an excellent export trade with England.

It was when the apple-eating Britons became panicky over the spray residue on American apples that England took definite steps to shut U. S. apples out of that country. They slapped an import duty of 50 cents a bushel on foreign apples and a vigorous "Buy British" campaign was launched. For many years previous to this the English markets had consumed 40 to 50 per cent of Virginia's commercial crop, and apple growers in the Pacific Northwest had become wealthy from their fine export trade. Now it looks as if all this is about to be revived for the Englishman unquestionably likes his apples and he knows they are good for him.

Lloyd C. Stark, former governor of Missouri, in a recent Orchard Day address said, "Today as never before the American people are beginning to appreciate not only the value but also the absolute necessity of more fresh fruit in the national diet. Now that we are living in a world of war, the necessity of building up the physical and mental stamina of the American people is imperative. Suddenly, the scientists and the research officials have realized that the production of apples and other fruits is just as important in our national defense as the production of machinery of war."

Wintering the Herd

Condensed from The Shorthorn World

James R. Douglas

WITH the exception of some portions of the Gulf Coast area and in the Southern and Pacific Coast states, where long grazing periods and mild winters prevail, there is a definite need during the late fall and winter months for adequate shelter and sufficient feed in order to insure the well being of all classes of livestock.

Many breeders look upon this season of the year with fearful anticipation, knowing full well that it is the most expensive period of the entire year.

There is no need, however, to view this period with alarm, providing adequate feed and shelter are made available in ample time to offset the possible hazard resulting from improper preparations for periods of inclement weather.

Some breeders prefer to leave their stock on pasture as long as a blade of grass remains. Cattle grazing short, dry herbage should receive a roughage supplement in order to maintain their normal weight and condition. Otherwise, it will be necessary to afford them fattening rations during the winter months in order that they may be in condition for pasturing in the following spring.

The cattle should be brought from the pastures and ranges in the fall to the central headquarters where they may be divided into age groups insofar as possible in order to give proper attention to the young growing stock and to winter the herd economically. In making preparations for wintering, it is well to bear in mind that beef cattle can withstand extremely cold weather, providing they have dry comfortable quarters. Cattle seem to be more thrifty when they are maintained out of doors than when confined to a closed barn which more frequently than not is overcrowded and insufficiently ventilated. Of course, a central barn is necessary for the storage of grain and hay, for quartering cows and nursing calves, as well as to offer facilities for handling new born calves.

Throughout the winter months dry cows and heifers should be kept out of doors in a well-constructed open shed, having an exposure opposite to the direction of prevailing storms. For this purpose either straight or L-shaped

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sheds will suffice. Some barns are constructed in such a manner as to serve this purpose.

There are no fixed rules regarding the construction of sheds, although a well pitched roof affords extra air space and will thus permit a deeper shed than would be advisable to build when a relatively flat roof is used. We have seen sheds ranging in depth from 20 to 40 feet and over 100 feet long. The main things to bear in mind are that the opening side should not have a clearance of over seven or eight feet and the deeper a shed is built, the greater should be the pitch of the roof.

Considerable feed and bedding will be saved if the roughage racks and bunks for silage and concentrates are built on the inside walls of the shed. The only advantage in using movable racks is that they will accommodate a larger number of cattle than one placed against the wall of the shed. A very desirable type of rack is the combination bunk and hay rack in which both hay and silage or concentrates may be fed. The amount of shed space necessary for each animal will, of course, depend on the size of the animal, but generally should range from 30 to 40 square feet.

The construction of a long alley-way flanked on each side by tie stalls for the cows and large box stalls behind to house the calves, makes for a very practical and convenient method of handling the cow and calf proposition in the central barn. Partition gates may be placed between the box stalls and the tie stalls wherever necessary. There should be one section of the barn devoted especially to quartering cows that are close to the calving period. For this purpose large box stalls are very satisfactory.

The expenses involved in wintering a beef herd may be reduced to a minimum without impairing the well being of the animals if home grown feeds are used insofar as possible. There is need for succulent feeds such as silage or root crops when cattle are not on pasture or when pastures are no longer productive. Legume or mixed hay and straw, fodder or stover, may form a portion of the winter ration. The older stock can utilize the coarser quality of roughages to better advantage than young animals.

A ration such as any of the following should be satisfactory for dry cows ranging in weight from 1100 to 1400 pounds: (1) 35 pounds of corn or sorgo silage and 6 pounds of legume hay; (2) 35 pounds of silage, 10 pounds of mixed hay, and 1 pound of protein meal or cake; (3) 35 pounds of soybean or sorghum silage, 10 pounds of straw or stover, and 1½ pounds of protein meal or cake.

It should be remembered that the maintenance requirements of cows are rather variable and that some rations will suffice for one animal but not for another. In other words, there are those that we call "easy keepers"—cattle that maintain a reasonable degree of fatness on seemingly small quantities of feed. It may be desirable to feed thin-fleshed cows a small quantity of grain, perhaps 3 to 4 pounds per animal per day, but generally there is no need to feed grain to mature pregnant cows in thrifty condition, when they are receiving roughages of good quality. If, on the other hand, the quality of the available roughages is rather low, then it may be advisable to feed a concentrate mixture such as 5 parts by weight of corn and cob meal and 1 part of protein meal.

With suitable protection available, yearling and older heifers should be kept out of doors during the winter months. However, in view of the fact that they are still growing, it is advisable to feed them liberally on good quality roughages such as corn or sorgo silage and legume hay, if possible. In addition, they should be fed about 5 pounds of grain concentrate per head per day. The quantity of grain to be fed will, of course, depend on the condition of the heifer and the quality of roughages they are receiving.

Cows nursing calves through the winter months should be placed in lots or pastures close to the central barn during the day and have access to protection from adverse weather. In order to keep them in a thrifty condition and to stimulate the milk flow, they should receive more legume hay than is generally afforded dry cows. About 35 pounds of corn or sorgo silage, 12 pounds of legume or mixed hay, and 5 pounds of a mixture such as 3 parts by weight of corn and cob meal and 1 part each of wheat bran and protein meal per head daily, makes a very suitable ration. A mixture of 2 parts of bone meal to one of salt will supply the necessary minerals when fed at the rate of about three ounces per day.

Cows or heifers due to calve within a few days should be comfortably housed in box stalls. There is no particular need to change their rations previous to calving, but immediately after calving it would be well to supply them with lukewarm water followed in a few hours with a small quantity of oats, bran, and legume hay. I believe that it is desirable to leave the cow with her calf for a day or two as young calves desire to nurse frequently. After the cow has been turned out with the herd it is desirable to permit the young calf to nurse three times a day and on mild

days to leave it with its dam for a few hours during the middle of the day.

When the calves are 3 or 4 weeks old they should have access to a grain mixture, such as equal parts of coarsely ground corn, ground oats, and wheat bran along with some good quality leafy legume hay which will supply them with calcium, protein and vitamins. As the calves progress a more fattening ration will be necessary. A ration composed of 4 parts by weight of ground corn or barley, 3 parts of ground oats, 2 of wheat bran, and 1 of pea-sized linseed meal and legume or mixed hay should be quite satisfactory.

Proper ventilation is necessary for the well-being of all classes of cattle and particularly in the care of young stock. This may be accomplished in the central barn by opening the windows from the top in order that the calves will not be subjected to a direct draft. The stalls should be kept clean and dry. Fresh water and salt should be available at all times.

The bull may be turned in with the cows or kept at the barn, depending on the breeding program and the desire of the herdsman. In either event he, too, should have ample exercise and if handled separately from the herd should not receive more than one-half to two-thirds of a pound of grain per 100 pounds live weight in addition to roughage. Young growing bulls, on the other hand, should be fed liberally and can handle without difficulty one to one and one-third pounds of grain per 100 pounds live weight in addition to corn or sorgo silage and legume or mixed hay.

It will prove beneficial to supply all growing animals with bone meal and salt at the ratio previously mentioned for cows and unless legume hay is fed, calcium in the form of ground limestone should be supplied also. The body requires a ratio of about two parts of calcium to one of phosphorus for proper bone development.

It is very important that all classes of cattle receive sufficient exercise throughout the winter and therefore they should have access to lots or fields where they may move about at will. When weather conditions are favorable, young calves should be turned out in a paddock to exercise.

Calcium-Bearing Versus Neutral Fertilizers

Condensed from Commercial Fertilizer

Wm. A. Albrecht
University of Missouri

OUR increasing knowledge of nutrition has been compelling us periodically to list newly recognized requirements in the diets of plants, of animals, and of humans. If fertilizers are to be helpful in meeting these newer demands, then their composition must be shaped to improve the plant's synthetic performances and thus to initiate, by way of the soil, the improvements in kind and quality of their products to be used for the better nutrition first of animals and finally of humans.

Our knowledge about plant nutrition was long content to list but ten requisite chemical elements. Today that list has been extended, at least by four. It may soon be further extended. For animal and human nutrition, the essentials were listed for a long time as proteins, carbohydates, fats and minerals. Only lately "accessories" were added, referring not to a single item but to many, as this all-inclusive term indicates. With the increasing number of vitamins now recognized under this category, our minds are prepared for an extension of this list.

Fertilizer thinking was long tied down to the three ingredient concept. Later it was adjusted to include the micro-nutrient necessities. This was a very easy adjustment when these were already passing into the goods mainly as unavoidable accompaniments or contaminants. Now that soil fertility has declined to the economic danger point, with resultant disturbances in animal and human nutrition manifesting themselves in many deficiency diseases some constructive thinking must be applied to revised fertilizer composition. This is especially important if fertilizer use as a soil treatment is to make crops yield not only more tonnage, but also feed of the quality and of the nutritional effectiveness it must eventually have. On the basis of better plant performance, the fertilizers and their functions may well be given critical examination in the light of (a) the various and intricate soil processes, and (b) the plant's complicated physiology, as science is rapidly elucidating them. It is from this viewpoint that the question of "acidity" of fertilizers deserves to be viewed. We need to raise the question

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whether this so-called "acidity" is so simple as a mere matter of the physico-chemical condition relative to the hydrogen-ion concentration of the mixture itself, or of the ash resulting from its ignition.

The introduction of the hydrogen electrode as a laboratory tool, brought a greater refinement in measuring the degree of acidity than had previously been possible. But when scientists can see better, or farther, objectively, it does not necessarily follow that they can see more clearly subjectively. Soil scientists seized quickly upon the hydrogen electrode for more critical study of soil acidity. They found that when limestone was applied to the soil for improved legume growth, it also corrected soil acidity. From these observations they drew the conclusion that soil acidity was the enemy of the leguminous nitrogen-fixing, protein-rich forage crops. This conclusion that calcium carbonate can remove, or reduce, soil acidity was objectively correct. But to say that it is the correcting of the soil acidity by the limestone that improves growth of the legume crop, is subjectively incorrect. Such observation demonstrates that nature is consistent, but such reasoning illustrates that human logic may be decidedly inconsistent. Reliance on the effect of limestone as calcium carbonate, or as magnesium carbonate, on the acid soils for the neutralizing effects by the carbonate radical rather than for the plant nutrient significance of these two dibasic cations, calcium and magnesium, may be leading us astray in fertilizer thinking. It has been leading our soil thinking astray where it has been diverting our attention from the function of calcium as a fertilizer to that of its carbonate as an antidote for hydrogen presence.

That soil scientists and plant physiologists should have neglected the role of the element calcium and should have given the carbonate premier significance in soil improvement by liming for crops, seems strange. As early as the days of Benjamin Franklin, a story of his experiences with gypsum, or land plaster, for clover improvement was widely told. That gypsum, as calcium sulfate, with no acid neutralizing power should benefit red clover points suggestively to the possible importance of the calcium. It emphasizes calcium all the more when chemical analyses of this crop tell of its lower sulfur but high calcium content, and when young animals demonstrate it as an excellent growth-promoting feed.

It was the observations by farmers that cast doubt on the accuracy of the deduction that liming is beneficial to the crop

through acidity removal. Farmers using limestone to get clover on heavy soils with high buffering capacities found crop establishment and improvement where no change in degree of acidity could be shown. They showed that acid soils need calcium to get a clover crop even if the acidity is not corrected. Their suspicion of the inaccuracy of the belief that the degree of soil acidity was the disturbing factor provoked experimental tests to separate the effect of the calcium from that of the carbonate. For this purpose use was made of such compounds as calcium chloride in commercial Dow Flake and of calcium silicate in the form of ordinary cement. Both of these gave beneficial results in legumes on lime-deficient soils. Here, then, the legume growth was improved by applications of calcium that carried no carbonate, and did not reduce the degree of acidity.

Similar confusion apparently prevails about fertilizer acidity, and fertilizers are about to undergo universal acidity correction. Again, very fortunately, the economic aspect has come to our rescue unbeknown to us. The cheapest carbonates in the form of calcareous and dolomitic limestones are going to correct the fertilizer acidity. Unwittingly they are providing extra nutrients as calcium and magnesium to deliver the beneficial effects when, in our confusion or misunderstanding of the facts the acid neutralizing value of the carbonate is given the credit. If sodium carbonate were not more costly, and were more convenient, it might have gone in and given disastrous disturbances to our acid neutralizing belief. Its substitution of sodium for calcium would have revealed the wrong interpretation of the value of making fertilizers "neutral."

Up to the present time, fertilizer analyses have paid no attention to available calcium. This nutrient of a fertilizer deserves consideration since in the humid region the increasing calcium deficiency in the soil is roughly the reciprocal of the increasing soil acidity. That liming the soil is beneficial because it delivers calcium to make up this soil shortage rather than because it removes the hydrogen ions was clearly demonstrated by some research using carefully prepared clays of different degrees of acidity. By mixing different amounts of clay with sand, the soybean plants could be given more or less calcium at any degree of acidity or pH. The plants grew better with less acidity. But they also grew better at any degree of acidity as they had access to more clay and to more calcium.

As a more accurate test, a series of clays with increasing amounts of calcium (representing increas-

ing degrees of saturation of the clay by calcium) and accompanied either by decreasing amounts of hydrogen as acidity or of barium as neutrality were used to grow the same crop. The amounts of clay for addition to the sand were chosen so as to deliver the same amount of available calcium in every case. Strange as it may seem, the crop growth followed the degree of calcium saturation. The crop content of calcium did likewise, regardless of whether hydrogen or the degree of acidity was decreasing, or whether all the soils were neutral.

Here the lime addition demonstrated clearly that its beneficial effect was not one of fighting the soil acidity by means of its carbonate addition as a neutralizer, but that it was one of supplying calcium as a plant nutrient. Viewing fertilizers in the same light, we may well raise the question whether it is the neutralizing of their acid that is significant, or whether it isn't the addition of the calcium as an extra nutrient, or possibly calcium as a mobilizer of other nutrients, that makes the so-called "neutral" fertilizers of more value as crop producers.

The increasing degree of calcium saturation of the soil makes the treatment more effective in delivering its available calcium to the crop. According to these studies, as the calcium was put on less clay to saturate it more completely, a larger percentage of the exchangeable calcium moved from the clay into the crop. With the clay carrying 40 per cent saturation, the crop used but 12.3 per cent of the available supply. With 87.5 per cent saturation of the clay the crop got 29.3 per cent of the applied lime. The efficiency of use increased more than twice. The concentrations of calcium in the crop for these two degrees of calcium saturation of the soil were .50 and .76 per cent respectively, or the crop was made about 50 per cent richer in calcium concentration by what corresponded to drilling the calcium into the soil. In relation to our need for calcium-bearing feeds, this improvement may be significant.

Drilling fertilizers with seedings may at times be detrimental to germination. This effect is reduced, and germination may be improved, by adding calcium chloride which is a salt that has no neutralizing value. This effect has been shown for such nonlegume seeds as tomatoes and bluegrass. Whether this effect is one of lessening fungus injury to the seed or one of improved germinating physiology has not been determined. Nevertheless, increased calcium offerings have been shown to lessen the fungus attack on soybean seedlings in what resembled the more com-

mon "damping off". Even if the exact function of the calcium in the improved seed germination is not understood, its beneficial effect is recognized and its use becoming an adopted practice.

Such results point out that by putting the calcium, as has been done with the other nutrients, into the limited soil volume to saturate a part of it more completely, as is the practice by drilling, there is a much greater efficiency in getting the nutrients into the crop. This is the fundamental reason for drilling, rather than broadcasting, even limestone. Drilling makes the calcium carried by the fertilizer so much more effective than we have been wont to believe and brings calcium up for consideration as a significant nutrient within the fertilizer mixture.

For purposes of illustration let us imagine that the soybeans used in these studies were drilled with a 4-12-4 fertilizer at 200 pounds per acre. Let us suppose they made a ton of hay. According to their analysis they would contain the calcium equivalent of 40 pounds of calcium carbonate. With the gypsum of the fertilizer contributing the calcium equivalent of about 32 pounds of calcium carbonate, and with the neutralizer for the ammonium sulfate acidity adding about 60 pounds, then this drilled fertilizer would be delivering 92 pounds of carbonate. At a 30 per cent efficiency figure found in the experimental studies, this fertilizer treatment would provide almost three-fourths of the calcium required for the ton of the soybean hay. Drilling the "neutral" fertilizers makes their calcium content effective. It suggests that when fertilizers are neutralized by limestone or dolomite, this is simply a case of supplementing the calcium already in the acid fertilizer in order to supply more nearly the amount of calcium badly needed by the crop. It is making for more effectiveness of the calcium, needed by the crop and hidden away in the fertilizer.

That calcium is of service in mobilizing other nutrients into the plant was suggested over twenty years ago by Professor True of Pennsylvania. That it mobilizes soil nitrogen was shown by growing some soybean seedlings for ten days in sand only, and some in sand given calcium carbonate. These were then removed, washed and transplanted into an acid soil in order to test the significance of the calcium they could get and take with them in consequence of contact with the carbonate for but ten days of their seedling life. The calcium so gotten carried over to influence their growth. Those plants with calcium made more growth by 50 per cent in the first ten days after transplanting.

They excelled in growth for the rest of the time. During this same initial period after transfer, and before they had nodules, they took 20 per cent more nitrogen from the soil. The calcium that was carried within the plants served to mobilize the soil nitrogen into them.

Calcium serves also to mobilize phosphorus, according to studies with both leguminous and non-leguminous pasture crops. Phosphate used with limestone returned three times as much phosphorus in the crop as when phosphate was used singly. A critical study of the data from the outlying fields of Kentucky points out that the crop increases from the use of lime and phosphorus in combination are greater, in general, than the sums of their separate effects.

Calcium is not only instrumental in mobilizing nitrogen and phosphorus into the crop, but it has been demonstrated for soybeans that as its supply in the soil becomes low, the nitrogen, phosphorus and potassium may even move from the plant to the soil. Thus, the plant may contain less of these than was in the seed originally planted. Such movement in the reserve direction has not been shown for calcium. Apparently no growth occurs unless calcium moves into the seed and crop.

Experimental results also give some suggestion that the same holds true for magnesium as for calcium and that this element always moves into the crop if growth occurs.

With calcium mobilizing both nitrogen and phosphorus, and with all three of these nutrients associated with protein, which is the basis of growth, calcium may be more significant in growth promotion than direct measurement of calcium contents of crops might lead us to believe. It is some of these seemingly indirect effects that may be responsible for much that we believe is the benefit in making fertilizers neutral by means of calcareous or dolomitic carbonates.

That the calcium in the gypsum of the superphosphate is of fertilizer value has been shown by some work with blue grass. Superphosphate applied at the rate per acre of 200 pounds of 20 per cent served as the basis for using diammonium phosphate at equivalent rates. The same amount of nitrogen as was contained in this concentrated fertilizer was then applied as urea in combination with superphosphate of which the accompanying gypsum might exert its effects. These different treatments were used for bluegrass on a soil needing nitrogen, phosphorus and lime. Because of this latter requisite, extra calcium was used in amounts to equal that carried by gypsum.

This was used in both the sulfate and carbonate forms. The results are given in Table 1.

In terms of tonnage produced, the diammonium phosphate was no better than superphosphate coupled with a doubling of its own calcium content as gypsum, or about what one might expect from superphosphate on limed land. The nitrogen of the ammonia in the diammonium phosphate was not used by the plant to increase its growth as forage even though it moved into the crop. When, however, calcium equivalent to that in the gypsum of the superphosphate was added to the diammonium phosphate, then this nitrogen made plant growth, delivered nitrogen, and returned phosphorus in the crop on a par with that by urea in combination with superphosphate.

These facts indicate clearly that the calcium of the gypsum is serving to mobilize the nitrogen of the urea and the phosphorus of the superphosphate into the bluegrass. This was not done when nitrogen and phosphorus in combination as diammonium phosphate were applied in the absence of the calcium. In the light of such effects, calcium will soon take on importance as an ingredient in fertilizer. These data suggest the possible danger in going to the more concentrated nutrient carriers that omit the calcium. They indicate that we may well think of using fertilizers in combination with lime, or certainly in terms of the calcium they carry, more than whether they are neutral or acid in reaction.

The significance of calcium for the non-leguminous crop of cotton has been emphasized by the experiment stations of the South. Its service in mobilizing phosphorus was announced by F. L. Davis of Louisiana, when, as a result of his studies on available phosphorus in connection with nitrogenous fertilizers, he said, "Calcium containing compounds apparently maintain soil

Table 1. Diammonium phosphate as fertilizer in contrast to gypsum-bearing superphosphate and urea. (Results for bluegrass based on no treatment as 100.)

	Forage Yield	Total in Harvest Nitrogen	Calcium	Phosphorus
No treatment	100	100	100	100
Superphosphate	100	96	86	97
Superphosphate + extra calcium	103	98	96	97
Superphosphate + urea	110	114	119	113
Superphosphate + urea + extra calcium	109	114	112	109
Diammonium phosphate	103	112	86	95
Diammonium phosphate + extra calcium	110	114	109	111

phosphorus at the highest available levels." The data from that station reporting mean cotton yields for the three years 1938-40 in a test of different nitrogen sources in a 5-8-5 at 600 pounds per acre show some interesting effects from the fertilizers made "neutral." The increases in seed cotton in consequence of "neutralization" are given in Table 2.

Table 2. Increases in cotton from 5-8-5 fertilizer with different carriers of nitrogen. (Louisiana data)

Nitrogen carrier	Increase by fertilizer Pounds seed cotton	Increase by "neutralization" Pounds seed cotton
Nitrate of soda	250	
16-20-0 Ammophos.	—109	
16-20-0 Ammophos., neutral	— 47	62
Cottonseed meal	116	
Cottonseed meal, neutral	196	80
Sulfate of ammonia	— 81	
Sulfate of ammonia, neutral	1	82
Urea	23	
Urea, neutral	121	98
Calnitro	147	
Calcium nitrate	165	
Cyanamid	184	

If these small amounts of extra calcium used in neutralizing the fertilizers can give these increases, should not some significance be given to the calcium present in the fertilizer even before it was neutralized? The effects of fertilizer neutralization and those of the calcium-bearing nitrogenous compounds on the cotton, all suggest that emphasis on fertilizers should not go to their acidity but rather to their calcium bearing aspect even for this crop. When Ammophos reduces the cotton yield in Louisiana, as the data show, this again brings the gypsum aspect of the superphosphate in the mixed fertilizers into importance.

Much of the variation in cotton response to nitrogen from different sources in a mixed fertilizer may be connected with the variation in calcium content of that fertilizer, according to the suggestion of W. R. Paden, of the South Carolina Station.

Most of the southern soils need nitrogen, and phosphorus. They apparently fit into the category of the soil cited previously, within which the effects of the calcium were separated from those of the phosphate. The Louisiana

soils shows similar conditions for the concentrated Ammophos and poor crop yields. It is therefore most probable that much of the irregularity in the so-called "acidity" of the nitrogenous fertilizer is due to a shortage of calcium for the crop's most effective use of the nitrogen and phosphorus as well as for the crop's need of the element calcium itself. These conditions are aggravated more as the superphosphates are concentrated to reduce the accompanying calcium. Calcium deficiency is presenting itself more prominently because the long existent shortages are not being covered by heavier calcium dosages in the lower grade superphosphates.

Neutralizing a soil with calcium carbonate encourages manganese shortage in some crops. But as more limestone is put into a limited amount of surface soil to put more calcium into the plants, then more manganese is taken from the untreated lower soil. Accordingly, the limestone functioning as a carbonate plays a detrimental role, but functioning as a calcium contributor it has a beneficial role in the same crop.

Soils should not be neutral if the products grown thereon are to be rich in calcium in particular, according to research by R. A. Schroeder. His recent work with spinach demonstrates that more calcium and more magnesium moved into this common, mineral-carrying, dietary component when the calcium content of the soil was increased and the soil kept acid at pH 5.2, than when the same calcium fertilization took place and the reaction was changed to nearly neutral, or pH 6.8. The calcium treatment was much more effective in giving calcium returns within the spinach, when grown on acid reaction. Three units of calcium applied on soil at pH 5.2 delivered more calcium in concentration and in total, in the spinach crop, than when 12 units were put on the soil at pH 6.8. It narrowed the potassium-calcium ratio and suggests a composition nearer the proteinaceous, mineral containing vegetation rather than that of vegetation that is mainly woody matter. According to this, a fertilizer can have less calcium and use it more effectively by having acidity present. Perhaps spinach will be more effective as a mineral contributor, or as an anti-richitic factor, in our diet when we learn that the effects of calcium as a plant nutrient must be separated from the carbonate effects in acid neutralization, and that very probably even some hydrogen may be required in the soil to mobilize the calcium into the crop most efficiently.

Now that virgin soils are no longer available, we are more cognizant of the fact that we have

been farming the organic matter of the soil. The seriousness of this is evident, especially in the South, where the farmer experience still maintains that much of the fertilizer should be in the organic form. These facts remind us that the fertility in the organic matter is tuned with the growing season for delivery of the nutrients at the rates of decay suited to the needs of the growing crop. The use of strictly mineral fertilizers with the seeding does not fit into the picture of plant needs so well. Consequently, the leaching loss from fertilizers is being appreciated. It suggests that fertilizers may be used on grass sods or crops growing heavily enough to take up the fertilizers quickly and to reduce the leaching loss. With more fertilizer used on seed crops, particularly those with legumes mixed through them, the fertilizers will be held back against loss in leaching. Such will be building fertilizer into the organic matter to extend the season of its nutrient delivery when the sod is plowed up and put to a tilled crop. This will spread the fertilizer effect over a longer time, and make it less of a hypodermic one. In fact, it will be a case of fertilizing the crops whose organic matter will have an additional fertilizing effect on other crops following.

Fertilizers have an opportunity for greater service as the plant functions and soil processes are more clearly understood. Their use will increase only as their service becomes greater. No fertilizer manufacturer would want his goods to render other than maximum possible benefit. Attention to other ingredients beside the nitrogen, phosphorus and potassium bids fair to improve fertilizer effects and to extend their services.

The present concern about improving the reaction of fertilizer is testimony that manufacturers are eager to make their goods better. When these good intentions are supplemented by more fundamental information from research in plant physiology and soil science, fertilizer improvement will shift from this concern about neutrality to one of concern about calcium content. It may even aim to deliver hydrogen. It may add many other revisions that will be of greater value in making soils more serviceable for better plants, for better animals and better health to humans.

New System Farmer

Condensed from Capper's Farmer

W. K. Shourds

A FARMER who practices the short rotation system advocated by the Missouri College of Agriculture has a varied choice in utilizing the crops. Louis A. Bestgen, Cooper county, who uses both the single-year and the 2-year plan, sometimes pastures the crops off, usually limits the grazing and takes a grain crop, or he may pasture not at all. Other possibilities are hay from either one or both of the companion crops, grass silage from one and pasture from the other, or pasture and grass silage from both, although he has not employed all those usages.

From 10 acres of Balboa rye he got 6 weeks of spring pasture, to April 15, for 80 ewes and 70 lambs. Then he removed them to let a seed crop mature which yielded 36 bushels an acre and sold for 80 cents a bushel. Ordinary rye, he asserted, produced 12 to 15 bushels an acre in the community which accounted for the price farmers were willing to pay for the Balboa.

In the same field and under the same fence he had also 10 acres of winter wheat, but the sheep spent practically all their time on the rye, which is at variance with common experience. "I think Balboa is sweeter or more palatable in some way," he said, "because if that had been ordinary rye they would have preferred wheat."

Sweet clover had been turned under ahead of both rye and wheat. The land had been limed and terraced previously. A light application of manure had been made and 80 pounds of phosphate an acre were sowed with the small grain.

This field and another of equal size are used in a small grain-sweet clover rotation. The round provides 20 acres of second-year clover and 20 acres of rye and wheat with new seeding each year. For instance, the wheat-rye field will be the sweet clover pasture next season. The clover pasture last year was plowed down and seeded to rye and wheat in the fall, with a new seeding of clover this spring. After 3 times around for these 2 fields he switches to corn or Atlas sorgo on one and shifts the small grain and clover seeding to another field which was in row crop the previous season.

On the 18 acres he maintains

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a Korean-winter barley round. This is a 1-year rotation. The barley is Missouri Early Beardless. It cannot be seeded early enough for all pasture because preparing a seedbed would destroy the lespedeza seed which he wants to mature so it will volunteer. He also has two 18-acre bluegrass pastures. One of these is used for summer and the other for winter grazing.

"With this setup I have pasture any time the weather or the condition of the soil is fit," he said. "As far as availability is concerned that means 12 months of pasture. My first spring grazing is the rye, beginning April 15. Second-year sweet clover is ready from April 1 to 15 and will endure until August 15 when the old stalks are plowed down in preparation for small grain seeding.

"From sweet clover I go to the barley-lespedeza field. The barley having been harvested for grain in June the Korean will have made heavy growth by that time and can be grazed until frost. It will mature abundant seed for a volunteer crop the next year. Barley is seeded back after the stock are removed at a 2-bushel rate.

"Then the winter bluegrass field, which has been rested all summer, will be ready or I can use fall-seeded rye and new sweet clover. The system of sowed and rotation pastures provides an ideal over-lapping, normally, but like all other schemes is subject to default at times. In such cases I have the summer bluegrass field in reserve. In fact it is available at any time a shift is made, from rye to sweet clover, from clover to lespedeza or whenever any crop needs a rest or the next succeeding one is not ready. Similarly the barley may be spring pastured or grazed out completely if need arises.

"I recall one year when a heavy snow came December 23 and I had to feed 60 days, but there was plenty of good bluegrass pasture if the cattle could have got to it. So there is no question of providing the grazing, although in practice the period may be only 10 or 11 instead of 12 months."

Mr. Bestgen had on the 120 acres 119 ewes and yearling rams, 19 cows and heifers and 50 hogs which he considered normal stocking. The farm was badly gullied and sheet eroded when he began terracing 13 years ago. The next year he began liming and has spread 6 carloads of stone.

When the terracing program was completed in 1932, he adopted the rotation system described, which made him one of the first men to undertake the New System of Farming on a farm-wide basis.

"No other system will supply more grazing nor build land more

rapidly," he declared. "I do not believe it has increased the actual carrying capacity of the farm, though. I used to keep about 20 sheep and 35 Holsteins, but that meant I was cropping too heavily and as a consequence was losing my fertility. In fact I was overstocked, at least to the extent of the hogs, because they required corn, which I shouldn't have tried to grow.

"But whereas my land was getting poorer all the time under the old system, it is improving now from year to year. Further, by reducing overhead and particularly harvest expense, I am getting 25 per cent better net acre return. Now I feed a minimum of grain even in pork production, because I use skim milk and pasture to the fullest extent. Ground barley replaces much of the corn in the finishing ration. Barley is cheaper to grow and less exhaustive.

"Sheep feed and most of the cow feed comes from grass. Now I am preparing to shift to beef cattle instead of Holsteins as a further effort to relieve demand for grain feed."

Straw Laying House

When he built an emergency laying house at his farm in Johnson county, Missouri, J. W. Mutti didn't stop with a straw loft. The roof and sidewalls are of straw. The walls are 2 feet thick. Straw is tramped tightly between 2 strands of woven wire. The roof structure that supports the straw covering is made of poles laid on forked posts set in the ground. The posts that support the outer ends of the rafters also carry one of the strands of wire to hold straw walls in place.

The house, which is 30 feet square, is modeled somewhat after the plan used for the Missouri-type laying house. Hens housed in it performed better than those in a conventional-type building.

One of the problems Mutti had to solve was that of a watertight straw roof. When the first roof leaked, he covered it, at a cost of $10, with 2-ply waterproof paper, laid down shinglewise, then put another foot of straw on top of it. Rainfall in January alone was 4 inches more than normal, but there were no leaks.

—*Capper's Farmer*

One Man Handles the Work on a 120-Acre Dairy Farm

Condensed from Kentucky Farmers Home Journal

I. J. Mathews

EIGHT years ago, George Cronau decided to rent a dairy farm in Lake County, Indiana. In the city, he had first been the boss of a machine; then the machine became his boss. Now, after his eight years on the dairy farm, and working no harder, he has made machines his servants to such an extent that single-handed, he farms this 120 acres of land and takes care of his 12 cows and 12 other grade Holstein cattle. His health is better, he is no longer in constant fear of losing his job, nor haunted by the thought of becoming merely a nursemaid to a machine that is always ahead of him.

His philosophy of working to some definite goal and his planning that have made it possible for him to handle well this 120-acre farm, besides the chores that a dairy entails, are indeed stimulating in the face of the present shortage of farm labor.

After we had met, I made a mental inventory of the different piles of feeds in that barn. There was baled alfalfa hay, chopped soy-bean hay, chopped sheaf oat hay and chopped corn fodder. I peered down into his 10 by 25-foot silo and noted it was filled with chopped corn fodder. "Filled the second time," George volunteered.

The work standards say a 120-acre dairy farm is a two-man farm, but by taking advantage of proper machines, this dairyman does the hand labor incident to milking, stable cleaning, etc., besides keeping up the field work.

His tractor and his roughage mill with grain separator are what make it possible to get high milk production with one man doing all the work.

His roughage mill is set so he can blow the chopped corn fodder into the silo, blow chopped hay into the mows, or deliver ground feed into the bins. In this way, no time is lost and the storage space of the barn is used to best advantage.

Sheaf oats are chopped through the mill into one pile for oat hay; the clover hay is chopped into another pile. His concentrate is made of ground corn and ground oats, half and half, and two

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pounds of this is mixed with one pound of 34 per cent protein concentrate. Cronau fills his silo all alone.

You dairymen who go through this ordeal of silo filling each fall; when you have to drop everything and run around the neighborhood changing work; when it seems as though there are a dozen things around home that are simply clamoring to be done, you know just how glad George Cronau was to work out a method that would obviate these difficulties.

To begin, this man doesn't fill his silo with green corn. He waits until the stalks and leaves are fairly dry. Then he goes out in the morning with the corn binder and cuts down as much as he thinks he can shock or run through the roughage mill that day. After he has cut down that much, he shocks up part of it. This will cure in the field and be run through the mill as shock fodder during the winter.

The remainder, he piles onto the rack, hauls it up to the barn and starts the mill. He chops into the silo, corn and all, what he hasn't shocked up that day. Occasionally, the operator goes up into the silo and levels off the chopped fodder. In a few days, the silo has been filled, no time lost, nothing essential either left undone or delayed.

He told me: "I've tried feeding the cows green corn in the fall in the pasture field, but that is too wasteful. The cows eat nothing but the ears anyhow, the most aggressive cow gets the bulk of the grain and by the time they have chased each other around over the stalks only a few leaves have been eaten.

"With the mill, when I start breaking out the corn field in the fall, what is cut is run through the mill. Everything is eaten, the grain is equally mixed with the roughage and each cow gets what her production entitles her to."

The oats and clover hay chopped during the summer is all used for the summer feeding because this man says it is always profitable to supplement the feed the cows get on pasture. The chopped soy-bean hay is mixed with the chopped corn fodder for the roughage during the winter.

His silo is filled in October and by February, it is empty and he refills it with the shocks that he makes in the field each morning while he is filling the silo the first time.

Cronau watches the little things.

"You don't want the corn fodder too dry," he told me and added that if it is too dry, it doesn't develop the fine fragrance that makes it so palatable to the cows. So when the silo is refilled in winter, he tries to strike a time when

there is some snow or moisture on the shocks so that there will be some fermentation in the mass in the silo.

This observant dairyman is positive that where the hays are chopped uniformly short, say through a ¾-inch screen, you can store the chopped roughage in one-third the space it requires when stored whole, and makes better feed.

To demonstrate, he showed me a pile in which he had stored 22 loads of soy-bean hay. It was between 7 and 8 feet high, and about 10 feet wide and not over 20 feet long.

He believes palatability is an enormous factor explaining the amount of roughage a cow will consume.

Cronau declares one big saving in time that results from chopping is the saving in handling the quantity of feed consumed by such a herd of cows. "You can feed cows much faster with a scoop shovel than with a pitchfork," he asserted. "And you can be sure that each cow is getting what she has coming. No one cow with a long neck is going to stretch out and monopolize the roughage of both cows on either side of her."

George Cronau's monthly milk check is a pretty good-sized one. Most machinists would gladly trade their net income for his. His health is good; nor is there constantly hovering over him that initiative-destroying fear of being fired. The machine is his servant, enabling him to multiply his effort many fold.

Pan-American—New Tomato

Pan-America, a new fine quality tomato with high resistance to fusarium wilt, is one of the latest achievements of plant breeders in the U. S. D. of A. The department has no seed for distribution, but dealers should be able to supply seed by next spring.

The new tomato was developed from a cross between Marglobe, the variety most widely grown in the United States, and a wild species known as the red currant tomato, collected in Peru. The wild parent is practically immune from fusarium wilt and has passed this character along to the hybrid Pan-America. Fusarium wilt has been one of the most costly tomato diseases in the eastern and southern United States.

In addition to its remarkable resistance to wilt, Pan-America is highly productive. It usually reaches maturity a few days earlier than Marglobe, and appears suitable, says the Bureau of Plant Industry, for canning, manufacturing of tomato products, or for marketing fresh.

—*N. J. Farm and Garden*

British Farmers at War

Condensed from British Library Leaflet

L. F. Easterbrook

WHEN war broke out, Britain's problem was to feed 6¾ million more people than in the last war from 4½ million fewer acres under the plough. Some 2½ million acres, or about one-tenth of her land under grass and cultivation, was also lost to food production since the days of 1918 on account of new factories, ribbon building, airdromes and land allowed to go to waste. Less than half our food supplies were home produced and we had come to depend to a very much greater extent upon food stuffs from overseas, mostly grown in the wheat lands of the New World.

Britain has dispensed with 6⅝ million tons of these imported food stuffs over the past twelve months. In terms of wheat and reckoned by average British yields, this represents the produce of about 7 million acres of arable land, and our total of arable before the war was under 12 million acres. Yet, in spite of this enormous curtailment in the raw material of food production, Britain today is already producing more food than before the war. It is an achievement by her farmers that has astonished the most optimistic prophets.

No official figures of production are published in wartime, but it can safely be said that, with reduced consumption due to rationing, Britain at the end of the second year of war is producing quite 60 per cent of her food requirements although she has had to grow as well her own supplies of animal feeding stuffs formerly imported. Next year should show further advance towards self-sufficiency in food.

How has this been accomplished? The real heroes are the farmers. As in America, British farmers are strong individualists, and when it has come down to the improvisations and the overcoming of the hundred-and-one difficulties that present themselves on every farm under wartime conditions, their individualism has stood them in good stead. No totalitarian system could ever have produced such resourcefulness, such determination on the part of each one to make his own contribution to the war effort in his own way.

They appreciated the situation from the beginning, as the following illustration will demonstrate. It was on a lonely hill farm in Westmoreland, a small farm of

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100 acres or so, the sort of place where the daily papers arrive, if at all, two days late, and it was within the first six months of the war. I found the farmer there scything some rushes in a grass field he was preparing to plough.

"There'll be fifteen acres of oats here next harvest," he told me. "It's not much, for there's only my son and me. But it'll help to make more space in a ship."

That was the spirit that produced the food, and it showed itself in a hundred different ways. Thousands of acres of derelict land, for example, have been debushed and ploughed up by the enterprise of individual farmers, mostly men farming only a few hundred acres and without large financial resources behind them. It was land that had been derelict for twenty, forty, fifty and seventy years; some of it had never been ploughed, so far as can be estimated, since Saxon times; some of it was so thick with thorn trees and undergrowth a year ago that animals that now and again had died in it could not be found for days. But somehow they managed it and each man who thus added his quota to the area of Britain that will grow food, knew that he was making a vital contribution to the war.

But all this effort, however well-intentioned, would not have got us very far unless there had been direction and a national plan. Such a plan was ready and slipped into action on the day war was declared. Indeed, it began to operate four months earlier, when the Government undertook to contribute $8 per acre towards the cost of ploughing up permanent grass in May, 1939. But in England, even more than in most other countries, conditions vary enormously from farm to farm, almost from field to field. Success of the wartime plan was bound to depend upon recognition of these local circumstances. So it was decided that the execution of the plan must be in local hands. County War Agricultural Committees were therefore appointed in every county consisting of landowners, farmers and farm workers. They, in turn, appointed district committees, and there were even committees in every parish in some counties. All this public service was voluntarily given, the brunt of the work falling on farmers, although there is a paid Executive Officer, with one or more assistants, in each county and the aim has been to attach a paid technical expert to every district committee. To provide this expert staff, agricultural colleges and institutes were closed down and scientists working in them left their laboratories for the fields. This has brought beneficial results both to the farms and to the scientists.

This is how it has worked in practice. The members of the district committees have visited their fellow farmers, walked round their farms with them and settled by agreement what grass fields shall be ploughed up for arable crops. In 99 cases out of 100 this worked quite satisfactorily. But there are always the awkward people, the non-co-operators, and the Committees were armed with power to compel these people to make their contribution. But their number was insignificant. There were also the really bad farmers, who would not, or could not, make proper use of their land. The Minister of Agriculture has power to remove such men from their land and find other tenants for it. This has occurred in about 2,000 instances, not a big proportion from nearly 500,000 farms in Britain. It has not been a bad example of democracy, of government in consultation with the governed.

Every farmer now knows exactly what he has to do, and many counties have issued roughly drawn maps to each of their farmers showing every field and the crop that is to be grown on it. This schedule cannot be departed from except by the County Committee's permission. It is control in a very drastic form, but the farmers have accepted it willingly as part of their war effort.

The control is necessary because some things become more important to grow in wartime than others. Wheat and potatoes, that produce so much human food per acre, obviously had to be extended. Also oats, that produce both human and animal food; the same applies to barley in a lesser degree. Milk production had to be maintained because it stands by itself in terms of food values.

Cattle and sheep have been given the next priority to dairy herds because their dung contributes to the fertility of the land and helps the ensuing crops, and also because if cattle and sheep are drastically reduced in numbers it takes a long time to build the flocks and herds up again. But grass sheep have been reduced and we are now in the process of reducing to some extent both dairy and beef cattle. But it is the bad doers, the poor yielders and the wasters that are being weeded out so that the animals that remain will be those that can make the most of the rations that are available. At present only a reduction of about 5 per cent is being aimed at; this will affect our milk supply little, if at all, and during the war and after, British agriculture will be the better for having dropped these uneconomic passengers.

When it comes to pigs and poultry, however, it is a different story. These have borne the brunt of the sacrifice of livestock, part-

ly because their numbers can quickly be increased again when that is possible, but chiefly because so many of our pigs and poultry before the war were being kept almost entirely on bought feeding stuffs. These feeding stuffs are no longer to be had; they have had to make way in the ships for munitions and raw materials of war. Many pig and poultry specialists, especially small men with little land to grow their own feeding stuffs, have been ruined. They represent the casualties and tragedies inseparable from war.

But even to maintain our reduced livestock population, and above all to keep up the milk supply, much of our newly ploughed land has had to be devoted to forage crops such as vegetables, beans, kale and turnips. It has also been necessary to make better use of the grassland that remains, by pasture improvement, by skillful management to extend the grazing season at both ends, by making better hay and by making silage. A great silage drive is now in progress, with 3,300,000 tons of silage the objective. Before the war, Britain probably did not make 50,000 tons of this valuable form of winter keep.

As regards labor, agriculture, of course, was given favorable treatment as a reserved occupation and every effort has been made to retain the key men. Nevertheless, the industry has already contributed many thousands to the armed forces and another 10,000 will be called up after harvest. Yet, in view of the very big increase in output, more rather than less hands have been required on the land. The Women's Land Army has provided some 15,000 extra hands in permanent farm jobs; and men, unsuitable for military service, have drifted back.

Volunteer labor from students, school-boys and local inhabitants has been forthcoming to help with the hay and wheat harvests, and land clubs have sprung up in various parts of the country. These land clubs are composed mostly of men and women in business who offer their services at week ends, draw current rates of pay, deduct their expenses and give the rest to charity. They work in winter as well as summer, helping even with such tasks as hedging, draining and ditching.

But all these outside sources would not have been sufficient had not the regular farm staffs performed prodigies of endurance, giving up their leisure and working tremendous hours. On thousands of farms the tractors—many of them American—have been going night and day, and, as with the farmers, all this extra service has been willingly given. The enormous increase in output

has been achieved with an inconsiderable addition to the number of land workers.

Hundreds of thousands of British acres, potentially fertile, had been allowed to fall into disuse and neglect under our pre-war policy of dependence upon farmers overseas for so much of our food. Hundreds of thousands of acres have been brought back to use again by clearing and ploughing the land, as already described, and by draining and re-conditioning it. Last year $4,000,000 was spent on land drainage; this year twice as much will be spent. Thousands of miles of land drains have been laid, thousands of miles of ditches cleaned out, and whole tracts of swamps and heavy clay have been won back from almost complete sterility to intensive production, and at a time when competition for man power for the services and for war industries has made extra men as difficult to come by as water in the Libyan desert. But the soil of Britain today is in better fettle, better cared for and more fertile than at any other time in this century.

As regards prices, they are guaranteed for all the important products, and so is the market. The farmer knows in advance exactly what he will get, and there is no limit to the quantity that he can sell at these prices. This has been a great stimulus. Further to stabilize his position, the prices of feeding stuffs and fertilizers are controlled and stabilized for a year ahead, and the Government has undertaken that the present relationship between such costs and prices will be maintained for anyhow a year after the cessation of hostilities while a permanent policy is drawn up. The Ministry of Food buys all livestock, potatoes and some vegetables. Cereals are marketed through the usual channels, with price guarantees; milk, at prices fixed in advance, through the Milk Marketing Board working with the Ministry of Food.

The ordinary householder is also playing an important part. Over 500,000 new war time allotments have been created to enable the consumer to grow his own vegetables, bringing the total allotments to about 1,400,000. More than 3,000,000 private gardeners have been encouraged and shown how to replace anyhow some of their flowers with vegetables. Household and garden waste is being converted into bacon and eggs through the formation of Pig Clubs and "backyard poultry" units, by which a pig or perhaps a dozen hens are kept by the householder largely on the scraps he used to waste. We are producing about 3,300 extra tons of pig meat a year by these methods and maintaining about 15,000,000 backyard hens.

The war, therefore, has meant a great re-awakening of the soil of Britain, and of those who live by it. It has led us to do many good things that we hope will be retained when peace returns. Above all, it has made us learn that the plough is the king-pin of healthy agriculture. We shall not grow wheat after the war for the sake of growing it. But we must aim at growing sufficient to allow the plough to play its part in a general system of balanced husbandry.

Your Cow Before and After Calving

Condensed from The Jersey Bulletin

E. N. Hansen
Iowa State College

COWS should be dried off so that they can get a month or six-weeks dry period. A good cow will give a 20 to 30 per cent greater production of milk and butter fat if given a dry period and put in the proper condition for her next lactation. Experiments have shown that heifers coming with second calf increased 33 per cent in production when given a six-week dry period, and 39 per cent when given a two-months' rest. Older cows increased 19 and 22 per cent, respectively.

"Proper condition" simply means feeding her and building up her body stores for production. A heavy producing cow has a tremendous drain on her body. If she calves in a thin or run-down condition, she cannot reach a high level of production and maintain it. True, a good cow will do her best to do so, even to depleting her own body of feed nutrients and her bones and tissues of minerals, until she may become seriously weakened. A cow usually milks 200 or more pounds of flesh off her body in her first few weeks after freshening. So it is obvious that she should be in good physical condition at the time of freshening, and this is best done by feeding her well during her lactation, giving her a dry period and feeding her liberally during that time.

Good milkers are sometimes rather hard to get dry. In many cases we must take away their grain, succulent feed as grass or

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silage, and sometimes substitute timothy or fodder for legume hay. Then skip milkings and gradually get the cow entirely dry. Some dairymen just stop feeding grain and succulence and entirely discontinue milking. They seal the ends of the teats with collodion as a precaution against disease germs entering the udder through the teat canal. The milk will accumulate in the udder but after a certain pressure is reached, secretion will stop and the milk will be reabsorbed. Whether you follow this method or the one of skipping milkings until dry, be sure to inspect the cow occasionally to see that she is drying off properly and that her udder is free of any possible infection. Drying off a valuable cow is a most important matter and should be attended to by a skilled person. Carelessness may cause the loss of one or more quarters of an udder.

After the cow is entirely dry, start liberal feeding so that she will put on flesh and build up her body. The roughage may consist of pasture which may be supplemented with summer silage or soiling crops, such as green corn fodder or legume hay. In addition, feed 5 to 15 pounds of grain daily, depending upon the condition of the cow and the nearness to freshening. A satisfactory grain mixture is 400 pounds cracked corn, 200 pounds ground oats, 200 pounds wheat bran, 75 pounds cracked soybeans or soybean oil meal and 75 pounds linseed oil meal. To each 100 pounds of grain mixture add 1 pound of salt and 2 to 3 pounds of steamed bone meal. Steamed bone meal supplies the important minerals, calcium and phosphorus. A cow low in calcium may be more apt to get milk fever which annually takes a heavy toll.

Experiments have shown that vitamin D from the sun's rays is important in fixing minerals in the animal's body. So dry cows on pasture and receiving a good mixture have ideal conditions for building up their bodies.

About 10 days to 2 weeks before calving, change the grain mixture so the cow gets what is called a cooling ration. This is done by reducing or eliminating the corn from the ration. A good cooling mixture is: 200 pounds of ground oats, 200 pounds of wheat bran, 100 pounds of linseed oil meal, soybeans or soybean oil meal, 5 pounds salt and 15 pounds steamed bone meal. Give the cow 4 to 8 pounds a day of this grain mixture plus hay, pasture or silage. A cooling ration has a beneficial effect on the cow and on her udder. Hard, inflamed udders may be partly caused by too large amounts of heating feeds.

Occasional wet bran mashes and wet beet pulp are good for

the cow close to or right after freshening. After freshening, continue feeding the cooling ration for 4 or 5 days and then if there is little or no inflammation of the udder a change may be made to the regular herd mixture. Do not bring a cow to full grain feed until about three weeks after calving. This is where it is important to have the cow in good flesh for she can then go up to high production by converting the body fat into milk.

Many calf losses are due to carelessness on the part of the feeder. The first few days are most important and attention to cleanliness, regularity and temperature of milk cannot be stressed too much.

In case one has sufficient room, it is an excellent plan to have two sets or more of calf pens. Use one set while the other is kept idle, after being thoroughly cleaned and disinfected. Then after three or four months, or a longer period, use the idle pens and let the others receive the disinfecting process. In other words, pens in constant use seem to harbor disease germs that are practically impossible to wipe out except by thorough cleaning, disinfecting and idleness for a few months. This is merely applying to calves the principle followed so long in raising hogs and poultry—that of changing ground. In case a calf is rather weak, try raising her on a nurse cow. Many dairymen use a nurse cow and let her raise three or four calves. At three weeks of age or so, the calves should be strong enough for skim milk, bucket fed, and other new-born calves can be put on the nurse cow. If you follow the plan of leaving the calf with her dam for three or four days and then bucket feeding, see that the milk is adapted to the calf, feed three times daily, feed only fresh sweet milk at body temperature and see that the pails are thoroughly cleaned and scalded.

See that the calves have fresh water and flake salt in their pens. Give them hay and grain as soon as they will eat it, which usually is from one to two weeks of age. Clover or early-cut timothy is preferable to rich alfalfa for calves under three months of age. Corn, oats and bran, equal parts, make a good grain mixture. Limit the amount of grain to that which the calf will clean up. Then the calf will consume more hay and that is important for its proper development. Continue feeding skim milk until the calf is five to seven months old. When about three to four months old the calves will benefit from pasture or a small amount of silage. After weaning, increase the protein in the grain mixture, using 300 pounds cracked corn, 300 pounds ground oats, 100 pounds wheat bran and 100 pounds of cracked

soybeans or oil meal. To each 100 pounds of grain mixture add 1 pound of salt and 2 pounds of steamed bone meal. In addition give free access to salt and to fresh water.

The number and quality of calves is always a good index as to the kind of dairyman that you are. Do not leave the calf-raising job to any hired man that may come along for it is a job that requires a man of experience who is honest with those calves in giving them the attention and care they deserve.

Peat Moss—A New Industry

Condensed from The New England Homestead

R. S. Anderson

PEAT moss in all its various forms has been poured into American markets from numerous European sources, notably Germany. Then came the war; out went German peat moss. Florists, manufacturers, poultrymen, farmers and others who use this unusual product of nature were momentarily "stumped"—but not for long. From Maine to Florida and westward there was an intensive search made for deposits of peat moss. Many were found. A new industry, that of furnishing American consumers with native peat moss, appears to be in the making.

Back in 1929 Mr. Otto R. Lehmann, of Glastonbury, Connecticut, purchased Neipsic Lake in that town for the purpose of developing it. Sluiceways needed cleaning, bushes and trees and stumps had to be removed. As the work progressed Mr. Lehmann found two large circular holes, evidence of the removal of peat moss by the early settlers. He also found many water ways where the springs had worked through to the surface. Probing with poles, he found the deposits of peat moss varying in depth from four to thirty feet in this old lake of some thirty-five acres. From that point on, Mr. Lehmann found himself in the peat moss business instead of real estate.

Further investigation of the ancient sluice showed the necessity of its clearance, that the water might flow freely from the lake. Mr. Lehmann then built a dam and gateway to connect with the sluice. In spite of this precaution, he finds that when the peat is removed to any great depth, water soons fills the hole and to

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resume work it must be pumped out.

The entire lake bottom is a rich solid bed of peat. Operations start with the removal of bushes, sod and top-soil. After the digging deepens perhaps to a foot or eighteen inches, the soil becomes a dark chocolate color, containing considerable leaf mold. Below this is the pure peat moss. This stratum has a rubbery appearance and cuts like butter. The beds feel like a heavy Oriental rug or cork mat when walked on. When dried and pulled apart, the peat has the feeling of felt separating.

The removal of peat moss and its subsequent handling is an art in itself. It was hard to get tools for working the material. After trying various types, Mr. Lehmann decided to design his own equipment. A machinist by trade, he had little difficulty in working out his ideas. He designed a sharp tool that looks somewhat like a long spade for the purpose of cutting out blocks of peat so that they can be handled easily, and be piled and air-dried. A similar tool used in the peat industry in Ireland is called a "splane."

After these peat bricks or blocks have been dried out sufficiently, they are pulverized. The problem of pulverizing them proved somewhat difficult until Mr. Lehman conceived the idea of using an air blower in an unusual hook-up. He removed the fan and equipped it with heavy steel cutters. Then he strengthened the retaining walls with heavy sheet metal. The dried peat bricks pass through this machine. After the steel blades have shredded the material, it is blown into a revolving cylindrical screen that grades it into coarse and fine texture. The peat moss is then further dried and made ready for the market. Though Mr. Lehmann has operated this peat bog in Neipsic Lake for several years, he has scarcely made a dent in the huge deposit.

Sales of peat moss are made to Eastern consumers mostly in Connecticut and Massachusetts. It is used extensively by tobacco growers in that meticulous job of preparing seed-beds. Florists and landscape men use it in the preparation of seed-beds and high-class lawns, particularly around public buildings. Though Mr. Lehmann hasn't sold it for this purpose, peat moss is also used in the manufacture of certain types of filters, wallboards, insulating materials, fuels and many other uses. In Europe where extensive peat bogs are found, it is used as a fuel and numerous oils, gases, and chemicals are produced from it. In Ireland it is also used in a whiskey manufacturing process, and for curing certain meats. Poultrymen and dairymen find it a splendid form of litter since peat moss

will absorb about fifteen times its own weight in water.

Mr. Lehmann's peat bog was probably just beginning to form in the Neipsic Lake as the Great Crusades swept over Europe. An old history of Glastonbury relates that the lake was known far and wide among the Indians as "Nipsic," meaning "place of water." This same history states that "the ferruginous waters wrought important cures." Early Glastonbury settlers evidently didn't agree with the Indians, for in 1759 Neipsic Lake was drained to secure some of the peat deposits they found on the lake bottom. The settlers used it for fertilizing purposes for a short time. The passing years clogged the sluiceway, and leaves and debris settled into the passage. The lake became partly filled again and Nature, once interrupted, again proceeded to build up leaf mold and peat moss. Thus this huge thirty-five acre bowl remained until it was rediscovered by Mr. Lehmann.

Below the peat deposit is the old original lake bottom of pure white sand. Mr. Lehmann tells an interesting story that indicates the depth of the deposit at the center of the lake. A scientist from the Peoria Academy of Science, in search of prehistoric flower seeds, pushed a specially designed augur into the beds for twenty-seven and one-half feet. He still could not reach the sandy bottom where he hoped to find the treasured seeds. Large limbs of trees estimated to be seven hundred years old have been found at a depth of four feet. In his office Mr. Lehmann displays for the interest of visitors a preserved lizard-like creature with no visible eyes, rudimentary ears, the tail of an eel, and with four legs and feet with four toes, which he found burrowing tunnels through the peat moss. When exposed to light it soon died. Inquiry revealed that the creature is an unusual one found in Mississippi, but practically unknown in these parts. How it got into the bog, or how long it had lived there, no one seems to know.

Nature, like man, finds this peat moss an excellent place to germinate seedlings. While walking beside a perpendicular bank of the material that has been allowed to stand for a season, one sees thousands of little maples growing at right angles from the bank, where the seeds coming from the neighboring countryside have struck.

Profits from Nuts

Condensed from Successful Farming

Ivy M. Howard

SUCH old stand-bys as walnuts, hazelnuts and chestnuts are proving to be dual- and triple-profit plants. And in the nut family there are many *new* members.

Before introducing the newcomers, including the hardy English walnuts of Minnesota and Pennsylvania nurseries that bore crops for the first time in 1940, let's see just what the old-timers are doing. They are producing nuts. They are providing a source of excellent hardwood, the walnut especially. And they are finding a prominent and permanent place in erosion-control.

On land unfit for cultivation because of its roughness or steep slopes, nut trees adapted to the areas are generally conceded to have a place—a place in helping make these areas profitable as well as in holding soil on them. Contrary to popular belief, grafted nut trees grow rapidly. And while they are growing they have the advantage over the quick-growing locusts, Bois d'Arc, and other trees—in that *they produce crops as they grow.*

Increased interest in erosion-control has helped focus the spotlight on nut trees. The Soil Conservation Service has, for example, planted thousands of walnuts in erosion-control work. Individual farmers, too, have made numerous plantings. While the mortality of these trees, many of them planted as seed, has been high, the survivors are, on most farms, considered well worth the time required to make all the plantings.

Nut trees are excellent for use in pot-holes, on hills too steep to be cultivated, on gullied areas, for shade and protection about the farmstead; and they can also be profitable on good, cultivated land. C. F. Hostetter, Lancaster County, Pennsylvania, has found black walnuts to be his best paying crop on cultivated land. Back in the days after the World War, Hostetter peeked into the future and saw days of surpluses of staple foods, picked up his spade, and started planting improved, thin-shelled black walnut trees. One thousand he planted in all, the first few hundred being spaced 50 by 50 feet apart and the last 60 by 60 feet.

As the trees grew, he cultivated them by tilling the sweet corn he planted between the rows. Thus the expense of growing the trees

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to bearing age was practically nothing, and the returns from the field were almost as great as if the trees had not been planted. When the trees were three years old, they began bearing, and now the oldest ones are 15 years old and the kernels of the nuts of these improved strains are selling at 80 cents per pound!

W. A. Adams, Payne County, Oklahoma, is another farmer who has found the planting of cultivated land to nuts profitable. He has both black walnuts and pecans, which are bringing him an average per-acre income of $50. High income from nuts on the Adam farm is at least partly due to the choice nuts he grows. Good varieties plus good care give good nuts.

Now for a parade of the new in nut crops for northern states: Out in front is the hican, a cross between the hickory nut and the pecan, possessing the thinness of the pecan shell and the flavor of the hickory nut. Closely following are the sensational English walnuts grown from stock of European importations. A Minnesota nursery has some 12,000 seedlings from Austria and Poland under test. Soon these hardy English walnuts will be available for all localities where the soil is correct and the season sufficient to mature black walnuts.

Hybrid hazels, filberts, chestnuts, and heartnuts are definitely in the what's-new parade. Many of these are more disease- and drought-resistant — and winter-hardy—than standard varieties.

As to varieties of nuts recommended for home and commercial plantings, the Department of Horticulture, University of Illinois, has prepared the following list: chestnuts (Gibbens—early, Boone, Champion Fuller); filberts (Barcelona, Brunswick, Davianna, Du Chilly, Italian Red, Jones Hybrids, White Aveline—a good pollinizer); hazelnuts (Rush, Winkler); heartnuts (Bates, Faust); hicans—hickory-pecan hybrids (Gerardi, Please); hickory nuts (Glover, Kirkland, Minnie, Romig, Swaim, Fairbanks); pecans (Greenriver, Major, Kentucky—a good pollinizer, Butterick, Busseron, Indiana, Posey); walnuts (Thomas, Ohio, Ten Eyck, Stabler).

Just when can you expect a nut tree to begin bearing? John W. Hersey, Secretary of the Pennsylvania Nut Growers Association, says "When in good soil, properly fertilized and otherwise well cared for, chestnuts and black walnuts have borne good crops three years after planting. Hickories and pecans may need twice this time or even more. Well-established trees that are top-worked with good varieties and given good care produce crops earlier than may be expected of young trees."

Lime, More Lime . . . For Vegetables

Condensed from New Jersey Farm and Garden

V. A. Tiedjens

THREE-FOURTHS of the vegetable growers in New Jersey are not using enough lime to get maximum yields. They should use more lime so that they can get ten dollars back for every dollar spent for fertilizer instead of two or three dollars which many now do. Our average yields in the state can be doubled if all of us will get our soils in the best condition. That means, lime, more lime, lime every year.

Larger yields mean greater profits per unit of production. Calcium is the keystone to improve physical condition of the soil.

Many growers in New Jersey are growing vegetable crops on soils which are naturally acid. In addition to being acid they are also low in calcium and magnesium. These elements are very essential for the growth of vegetable crops. The cheapest source of magnesium is liming material, although it can be supplied to the soil in such forms as Epsom salts and magnesium oxide.

The least expensive form of calcium added to the soil is liming material, and lime sweetens the soil. This is highly desirable for most crops.*

The first step in the use of liming material is to determine the calcium and magnesium content of the soil. The reading should be good to excellent in the subsoil as well as the surface soil. A pH reading alone may not tell the story because many of our sandy soils may have a pH of 6.5 and yet be poor in both calcium and magnesium. Such soils should be limed. If gypsum can be bought, it is good for such cases.

The amount of lime to apply depends on the soil type. If the subsoil is open and sandy, a ton of pulverized limestone or its equivalent in hydrated lime is enough to apply if the pH is 5.5 to 6.0. If the subsoil has much clay or sticky material, it may be necessary to apply two, three, four, five or more tons per acre before the best yields are obtained. The farmer will have to try it out on his own farm by applying one, three and five tons on strips a rod wide across his field and see where he gets the best results. Red soils may need more lime than the yellow soils. An

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asparagus grower told me he applied from one to five tons of limestone on separate asparagus rows and secured no increase until he applied five tons. There his yield was almost double. Many growers try a ton of lime per acre and see no benefit so they stop using it. Had they put on enough lime to satisfy the needs of the soil, they probably would have doubled their yields.

The kind of liming material to use depends on which is the least expensive and how it is used. If equivalent amounts of materials are used, it makes little difference which is used as far as the effect on the soil is concerned, provided the stone or shell lime is pulverized. Coarse material is not sufficiently active and will not correct acidity fast enough. One ton of pulverized limestone is approximately equivalent to 1,600 pounds of hydrated lime or 1,000 pounds of ground burned lime. Oyster shell lime is not as good as pulverized limestone.

There are two types of liming material: those that contain calcium and magnesium and those that contain largely calcium with only traces of magnesium. There is only one answer. If you need calcium, use the high calcium materials. If you need magnesium, use the high magesium liming materials.

If liming material is to be applied on the surface just before a crop is to be planted, the pulverized limestone should be used. If it is to be plowed under, either may be used. Hydrated lime should not be applied on the surface and plants set in it as many market gardeners often do.

The time to apply lime is less important than to get some lime on the soil. If you find you need lime this fall, get it on as quickly as possible. Lime applications in the fall have more time to condition the soil and greater benefits will result. If you find out that you need lime in April, put it on as soon as possible. If you need lime after the crop is growing, broadcast pulverized limestone over crops and all. It does not burn the foliage and rain will wash it off, while the cultivator will mix it with the soil. Hydrated lime should not be applied in this manner. It may temporarily slow down the growth.

The method of applying lime depends on where you want it. On most of our soils it is better practice to plow it under. Broadcast the lime before the ground is plowed. This is true where you have considerable clay in the subsoil. Plowing under lime helps to prevent plow soles from forming. Hydrated lime should not be applied too far ahead of plowing or cultivating. It tends to cake with moisture and does not mix well in that condition. The advantage of using hydrated lime is

lost if it cannot be immediately mixed with the soil. Limestone does not cake and, therefore, can be applied most any time before it is mixed. On the lighter soils liming materials may be applied to the surface after plowing, but it should be worked into the soil with a springtooth harrow. A disc harrow does a poor job of mixing lime into the surface. If the lime stays on the surface and the season is unusually dry, very little benefit will be derived from the lime that year. To get the most good the lime should be mixed with the whole plowed soil and if at all possible have it mixed with the subsoil too.

Plowing It Under

Pulverized limestone and fertilizer may be broadcast together and plowed under if applied in the spring. Hydrated lime may also be broadcast with fertilizer, but it should be plowed under immediately.

Due to the fact that many of our soils have subsoils which do not permit good deep root growth, growers should try out methods of getting limestone into or on the subsoil just below the plowed layer. Some growers have doubled their yields by this practice.

*** From the standpoint of growing sweet or white potatoes it may be undesirable. These two crops must be grown on soils having a pH of 5.5 or below. However, those soils need calcium and magnesium to produce good yields. The calcium content is kept up by the gypsum in the twenty per cent superphosphate used in mixed fertilizer. For this reason low analysis fertilizers should be used for these crops. If liming material is used on sweet potato soils, it should be placed below plow depth with special equipment so that there is no danger of raising the pH above 5.5 in the plowed soil where the tubers are formed. Experiments have shown that sweet potatoes will yield more, in some cases double the yield, when liming materials are applied, but the crop is unsaleable because of the prevalence of pox and scurf on the tubers. By placing the lime deep in the subsoil, the surface soil remains acid and the crop benefits by the lime because the feeding roots pick it up deep in the subsoil.**

Where barnyard manure is used on the soil there is less need for lime. An occasional application every few years may be enough. Where no manure is used, liming materials should be applied in small quantities (1,000 to 2,000 pounds) every year.

Studies on Some Important Pasture Grasses

Condensed from The Acco Press

R. L. Hensel

Agronomist, Texas Agricultural Experiment Station

A SEARCH for desirable pasture grasses which will remain green for long periods of grazing and which are not only heavy producers but are palatable and readily established has been under way by the Texas Agricultural Experiment Station for the past few years. It would seem that with the hundreds of grasses which are native to the state that this would be a comparatively easy task but the grasses which possess all of the desirable qualities and which can be grown over large areas under extremely variable climatic, soil, and moisture conditions are hard to find. At the present time Angleton grass, yellow beard grass, buffalo grass, and bahia grass are receiving the most attention.

Angleton grass was introduced into Texas in 1915 from its home in India. It was first tested at Angleton from whence it gets its name. It is a member of the same family to which little and big bluestem grasses belong but it differs from these in that it produces long runners which root at the joints and form a rather dense, tangled mass. The grass, although coarse leaved, is succulent and palatable. It also makes good hay. It grows under a variety of soil and moisture conditions and withstands a temperature of about zero degrees F. It has been propagated by rooted cuttings because the plants at Angleton did not set seed or those that were produced were of very low viability. Recent observations at locations other than Angleton, however, show that under different climatic conditions, viable seed are produced and that established stands spread rapidly to adjoining areas from seed, which are readily carried by the wind. Work is under way to ascertain if seed can be produced in abundance and cheaply harvested. If this can be accomplished, it will be possible to start this valuable grass in many other parts of the state which are now without a desirable, perennial summer grass.

Yellow beard grass is also a member of the little and big bluestem family but does not produce runners as does Angleton grass. It is a native of Central Europe and of Asia and was introduced into this country about 15 years ago. It is a clump or bunch grass

Reprinted by permission from the Acco Press, Houston, Texas, Sept., 1941

but the clumps grow so close together that it resembles a tall turf-forming grass. It is very palatable and is readily grazed by livestock. It appears to do well at points as far south as the Gulf Coast and as far north as Oklahoma. It spreads rapidly from seed and is able to compete successfully with Bermuda grass. Seed planted at College Station on April 1 germinated and grew well in spite of the fact that both April and May were unusually dry. By July 15 the plants had formed clumps a foot or more across and had already produced seed stalks and were green and growing actively all summer. This grass promises to be of considerable value for summer grazing, and being a perennial, does not have to be reseeded each year. It is relatively cold resistant. The seeds shatter soon after maturing and this fact makes the harvesting of seed difficult. Steps are being taken to plant yellow beard grass on a large scale so that in time seed will be available for distribution. Since this grass will grow in regions of heavy rainfall as well as in those having light rainfall, it appears to have great promise.

Buffalo grass is a short, sod-forming grass which spreads from runners and is native to the Great Plains from Mexico to Canada. It is highly nutritious, a heavy producer that will stand heavy grazing, and cures well on the stalks, that is, livestock will graze it even after it has ceased growing. It grows in a variety of soil, moisture, and climatic conditions as is evidenced by its wide distribution. Buffalo grass has plants which produce only male flowers and those which produce only female flowers. The seeds are in the form of small burs about $\frac{3}{16}$ inch in diameter. These seeds are produced in abundance but are borne so close to the ground that they are extremely difficult to harvest. The Experimental Station has just started extensive experiments with this grass to develop strains which will produce seed high enough above the ground to be readily harvested.

Bahia grass is a native of the West Indies and South America. It belongs to the same family as Dallis grass and resembles carpet grass but is coarser-leaved and taller, sometimes growing to a height of two feet. It is aggressive, sod-forming, and spreads from runners. Livestock graze it readily and it seems to persist under heavy grazing. The grass produces an abundance of seed, which, however, are generally low in viability. Planting failures are apt to occur for this reason. It does well in the Gulf Coast Prairie and generally remains green throughout the summer when other grasses are dormant.

One Hundred Pound Lamb Credit Per Hundred Pound Ewe Weight

Condensed from Sheep Breeder

THIS title is the accomplishment of only eight Michigan flockmasters in 1940. To the sheep owner it offers a goal reached by few.

This sheep project, supervised by the Animal Husbandry Extension Service of Michigan State College is a measure of production efficiency which includes the annual wool clip in addition to lamb weight produced in one hundred and thirty-five days. This project is developed as an improvement over the old Wolverine Lamb Production Contest which measured only pounds of lamb produced per ewe in one hundred and thirty-five days. The old project saw the Oxford breed winning all the honors. The new project sees the honors equally distributed between breeders of large and small sheep as well as between medium wool and fine wool flocks.

Flocks are enrolled during the winter and spring. After lambing dates are established, a weighing date for the lambs is determined one hundred and thirty-five days from the average birth date. To these lamb weights are added the total pounds of wool produced by the ewe flock (multiplied by three. Wool weights tripled are then credited as lamb weight.). This total divided by the annual average weight of the ewes in turn gives the production per 100 pounds of ewe in the flock.

In 1940 Orson Sober, of Fowlerville, with his purebred Shropshires that dropped 159% lamb crop, made his lambs weigh 90 lbs. at 135 days with a credit per 100 lb. ewe of 112.7 lbs. Seven Oxford breeders in the Thumb Area produced over 100 lbs. of lamb credit per 100 lb. ewes. These men had lamb crops as high as 197% and shearing weights up to 10½ lbs.

In the 1941 flocks some of the following reports have been obtained. Harry Wright, of Arenac county, with his flock of 26 Oxford ewes, has produced 3877 lbs. of lamb and 286 lbs. of wool, making his credit 105 lbs. per 100 lb. ewe. Emily Johnson Fox, of Cass county, with her flock of 50 Corriedale ewes, 26 of which are registered, produced 500 lbs. of wool and 4830 lbs. of lamb. The average ewe weight of 125 lbs. gives this flock a credit of 101 lbs. per 100 lb. ewe. Flock owners

Reprinted by permission from the Sheep Breeder, Chicago, Illinois, Oct., 1941

who make these outstanding records are to be each year awarded a medal by the Michigan Pure Bred Sheep Breeders' Association. Membership in this hall of fame for Michigan's sheep men will be reached only by those following the most carefully handled management program for twelve months of the year.

Practices gleaned from records on these farms show the following to be in use:

A high percentage of lambs is dropped and raised. To do this ewes must be maintained at a thrifty level and flushed at breeding time by improved feed or pasture conditions.

Individual lamb weights at 135 days average from 75 lbs. and up. Grain is always available in a creep or trough with a constant supply of succulent pasture such as alfalfa and smooth brome grass, or oats and rape or sudan grass.

Worm control was accomplished by use of copper sulphate and nicotine sulphate drench. Kamala was used for some persistent tape worm cases.

Shearing weights were all over 9 lbs. Year round thriftiness here is an important factor.

Condition of the ewes was neither excessively fat or thin. Exercise daily and open shelter seem to be factors that tended toward strong lambs delivered with minimum difficulty.

Flock rams were all purebred carefully selected for the thick-smooth, compact, meaty, rapid maturing individuals with good fleeces.

Cash returns per 100 lb. ewe on commercial basis with 9c lambs for 1940 show the 10 highest flocks with $9.00 or $13.50 per 150 lb. ewe.

Cash returns for cultivated pastures such as alfalfa and smooth brome grass mixture show ability to carry 3 to 5 ewes and their lambs per acre from May 15 through the pasture season until weaning time. Two hundred and fifty to 300 lbs. of lamb produced per acre at the 9c average shows return which makes pasturing profitable at times when labor is scarce and lamb prices are good.

The late March and April lambs on most farms seem to make the most economical pasture gains and get to market around Labor Day before prices hit the skids too badly.

The Agricultural Marketing Service

C. W. Kitchen

Chief, Agricultural Marketing Service

ONCE each month a section of the Department of Agriculture's South Building at Washington, D. C., is completely isolated. The doors to this part of the building are locked and armed guards are posted. Venetian blinds are lowered and sealed. Telephones are disconnected. Then, in an atmosphere almost as secretive as the Kremlin or the British Admiralty, the statisticians of the Agricultural Marketing Service settle down to the business of estimating the Nation's supplies and prospective supplies of food. This work is done at public expense and every precaution is taken to avoid "leaks," which might cause harmful speculation.

A few minutes before 3 P.M. the doors are opened and a group of men, headed by the chairman of the Service's Crop Reporting Board, carry the reports down the hall under guard to a room lined with telephone and telegraph instruments. Waiting there behind a white line painted on the floor are reporters, telegraph operators, and messengers. Face down before each instrument the chairman lays a copy of the report. As the hands of the clock reach 3, one of the press reporters cries "Go!" Scrambling quickly to the instruments, the men telephone or telegraph the important figures from the General Crop Report to the newspapers and markets of the world.

The collection and publication of agricultural statistics—the oldest activity of the U. S. Department of Agriculture—is only one of the major functions of the Agricultural Marketing Service. A Nation-wide market news service furnishes day-to-day reports on current prices, movement, and supplies at important consuming centers and shipping areas. A program of standardization and inspection provides a generally understood means of measuring quality in farm products. And various regulatory laws administered by the Service help to promote fair dealing in trading and provide the machinery for adjudicating honest differences. Many of these activities are carried on in co-operation with the States.

The work of the Agricultural Marketing Service traces rather directly to the tremendous size of American agriculture. Production and marketing—contrasted to the

self-sufficient farming system of a century ago—take place on a Nation-wide scale. All of this adds up to one simple fact: The farmer needs a wide variety of services—services that he cannot provide by his own initiative—if he expects to conduct his business on an efficient basis.

Farmers Furnish Information Voluntarily

More than 600,000 voluntary farm reporters and about 200,000 non-farm reporters fill out questionnaires periodically on various phases of agricultural production and marketing. The information furnished becomes the basis for reports on the acreage, yield, production, farm utilization, and sales of more than 100 crops; on numbers of livestock; on milk and egg production; on hatchery chick output; on prices paid and received by farmers; on wages of farm labor; on the rail, express, boat, and truck movement of farm products; and on storage holdings.

The average farmer does not look upon such information as "dry statistics." The farmers use these figures—just as the railroads, the automobile manufacturers, and the steel industry use statistics—as a tool for planning his production and marketing operations more intelligently. The prospective plantings report, for example, issued early in the spring, is widely used as a guide to planting operations. It shows rather accurately the approximate acreage farmers intend to plant to each crop. This enables farmers to shift to the crops that show possibilities of bringing the highest returns.

But official estimates of crop production benefit the farmer whether or not he makes direct use of them. The availability of unbiased estimates discourages the issuance of false and misleading statements by people who have a financial interest in the crop. Official estimates also eliminate much of the uncertainty that restricts the operations of business and leads to speculation. Most important of all, Government reports provide a fair, unbiased basis for the market prices of farm products.

Market Reports Keep Farmers Informed

Market prices themselves are a matter of keen interest to the farmer, especially when it comes time to sell. If his produce reaches market at a time the market is glutted, he may sustain a net loss on his entire season's operations. This need for information on day-to-day prices at the point the farmer sells his commodities led to the establishment of a Nation-wide market news service about a quarter of a century ago. Today, the Agricultural Marketing Service provides market news coverage on price, supply, and de-

mand conditions at important markets and sometimes in producing sections for more than 100 commodities.

As now organized the market news service functions somewhat like a commercial press association. Over 8,000 miles of leased telegraph lines link together the offices in the large cities, and the temporary offices maintained in the fruit and vegetable producing areas. This communication system permits the "swapping" of valuable information.

Like the press associations, the news is collected by reporters—market news reporters. The men who "cover" the fruit and vegetable and livestock markets are on the job long before the sun is up. They interview buyers and sellers to find out just what prices the products are selling for, and what conditions are affecting the market. These men must know the language of the market place and they must be able to feel "market sentiment," which is such a big factor in making prices. They must be trained observers and must be able to separate true information from false. In brief, they must be crack reporters in every sense of the word.

While the reporters are collecting information at the markets, other employees are telephoning the railroads and steamship companies, getting reports of supplies arriving or to arrive. During the night thousands of railroad agents have been filing reports by wire showing how many carloads of fruit and vegetables started to market during the previous 24 hours, and how many carloads of livestock are due to arrive for market the next day.

All of this information on prices and supplies is quickly brought together in the daily report, thousands of copies of which are mailed to individuals. Newspapers and other publications reprint the material, and many trade and growers' associations supply the information to their members. The dissemination of agricultural market news reports is very wide.

A recent survey showed that over 400 radio stations are regularly broadcasting the reports, and a number of stations supply remote control facilities direct to the market news offices. Some of the stations provide 3 to 5 scheduled broadcasts daily in order that producers in the territory served may be kept fully informed on changes and trends in the market.

One of the more recent developments in radio market news programs is the so-called "consumer broadcast" — written especially for homemakers. The market reporter gives daily developments on the wholesale markets that will help the homemaker

obtain economical "buys" and add variety to her menus. Such information undoubtedly helps to prevent the periodic gluts that are so costly to producers.

Standards Supply Common Language of Quality

Market news reports are quoted in terms of the Federal standards. A fruit and vegetable report may show that U. S. No. 1 potatoes are selling for $1.60 per hundred in New York, and for $1.40 per hundred in Chicago. The grower in Ohio, which is about equi-distant from the two cities, thus knows where to obtain the highest return for his crop. The standards have provided a common language of quality.

Standards for farm products are of two general types—mandatory and permissive. The standards for grain and cotton are of the mandatory type and must be used if these products are sold by grade in interstate commerce. And under the Tobacco Inspection Act all tobacco sold at auction on a market designated by the Secretary of Agriculture must be inspected on the basis of the official standards. But most standards are of the permissive type and have been developed for use in any way that promotes more efficient marketing. Standards, of both types, have been developed for about 100 of the important agricultural products.

The standards, complemented by adequate inspection, have a definite dollars-and-cents value to producers. Last year, for example, a Florida farmer offered for sale on a designated market a lot of tobacco that was certified as grade B4L by the Federal inspector. When the sale took place the tobacco was bid in at $15 per hundred. The farmer, after studying the tobacco price report, found that B4L had been selling at $22 per hundred. The bid was rejected. When the lot was again offered for sale, it sold at $22 per hundred—a fair price. There are records of many such cases in the files of the Agricultural Marketing Service.

In 1938 a free classification and market news service was developed for groups of growers organized to promote the improvement of their cotton. This service has been very popular and about one-and-a-half million bales were classified for the organized groups last season, each grower being notified of the grade and staple length of each bale. The individual grower did not need to guess at the quality of his crop; he knew in market terms the value of what he had produced. He was thus in a better bargaining position and was able to check on the quality of his improved seed.

The newest development in the standardization field is the "con-

tinuous inspection" of canned fruits and vegetables. In plants located in several States inspectors of the Agricultural Marketing Service observe the preparation and packing of certain food products at each step in the canning process. Such lots as are sold by the canner for labeling in terms of the U. S. grades bear the grade statement incorporated in the shield insignia authorized for that purpose. The program, developed at the request of certain members of the canning industry, is being carried on at the present time as an experiment.

This development grows out of the fact that more and more consumers are insisting on the right to know what they are buying. Because of the device, or stamp, or certificate, or other visual indication of grade, consumers are able to buy the quality desired and to pay on the basis of quality.

Official standards are developed only after painstaking research, and provision must be made to keep pace with changing conditions. Introduction of new varieties; ravages of insect pests and diseases; changes in merchandising practices; and improvement in the methods of handling, packing, and shipping, sometimes require revisions of grade specifications now in effect. This adaptation of the grades to changes in marketing needs requires a wide-awake, continuous research program.

Regulations Needed

All of the advantages that accrue to agriculture from a service program, no matter how comprehensive, would inevitably be canceled by a marketing system that allowed one group to benefit at the expense of another. Farm product marketing is no exception to the rule that any enterprise must be built on the firm foundation of honest and fair dealing.

In a recent case, a buyer after personally examining a carlot of apples prior to shipment, agreed to take them at a price of $582. The apples were shipped, but when they arrived at destination, the buyer claimed that part of the fruit was over-ripe and decayed and refused to pay more than $463. When the case was reviewed by the Agricultural Marketing Service, under the Perishable Agricultural Commodities Act, it was brought out quite conclusively that the apples shipped were the same apples that had been examined by the buyer, and that the fruit had undergone no appreciable deterioration. The shipper was awarded $119, plus interest, and the facts of the case were published.

The Perishable Agricultural Commodities Act cannot prevent all irregularities and abuses in the marketing of fruits and vegetables but it is a powerful deter-

rent. The act makes nine specific practices—unfair practices—unlawful. The act requires that anyone engaged in handling fresh fruits and vegetables in interstate commerce must have a valid license from the Secretary of Agriculture. If a licensee is found guilty of an offense he may be punished by publication of the facts or suspension not to exceed 90 days, or revocation of his license. The Secretary of Agriculture may receive from injured parties claims for damages resulting from any violation of the act, and, if the claim is supported by proper evidence, issue a reparation award against the offender.

The Packers and Stockyards Act is aimed at preventing and correcting irregularities and abuses that may arise in the operation of the stockyards and meat-packing industries. And the act, since its passage in 1921, has been amended to extend regulation to the rates and practices of persons engaged in marketing live poultry in certain cities and markets. Under the act, unfair, unjustly discriminatory, and deceptive practices, or the control of prices, or the establishment of monopolies are unlawful. Authority is also given to the Secretary of Agriculture to fix and approve rates and charges of stockyard companies and market agencies at public stockyards throughout the country.

The Federal Seed Act requires that agricultural and vegetable seed shipped in interstate commerce be completely and correctly labeled and provides for the establishment of minimum standards for vegetable seed shipped in interstate commerce. Interstate shipment must comply with the noxious-weed-seed requirements of the laws of the States into which the seed is shipped. False or misleading advertising or labeling of seed as to quality and origin is prohibited.

The Federal Insecticide Act makes illegal the interstate shipment of insecticides and fungicides, including disinfectants, that fall below the strength under which they are offered, that will not accomplish the results claimed for them, and those that are injurious to vegetation.

These and other statutes administered by the Agricultural Marketing service are not aimed at imposing burdensome restrictions upon honest and fair dealing. Rather, they are intended to be an aid. What is sought is the maintenance of free, open, and competitive markets at which unfair trade practices are reduced to a minimum.

Little Beans — Big Business

Condensed from Farm Journal and Farmer's Wife

R. W. Howard

THE 1941 crop of American soys will probably total one-third of the world crop. The 2,000 acres that grew in the U. S. A. in 1909 has increased to 5,500,000 acres this year, is expected to go on beyond 7,000,000 acres in 1942. Soybean oil may, for the first time, pass cottonseed in making shortening, soap, cooking fat and oleomargarine, then go on to fill the gaps left by insufficient supplies of tung and castor in the manufacture of paints, varnishes, linoleums and rubber substitutes. The protein is causing new factories to go up in Ohio and Illinois for the manufacture of plastics, glue, fibers, airplane parts and paper gloss. The meal is changing feeding practices on western ranches. Soyburgers, soy nuts, soy coffee, soy flour and soy salads are flowing into the grocery stores. Soy hays fill silos with heavy, sweet feed. Soy roots, freckled with fat nodules of nitrogen, are putting growing power back into a million American acres.

That is the one generation story of the Chinese wonder bean, first planted in quantity around Rutgers University at New Brunswick, N. J., in 1878, but brought into prominence after the World War by a handful of midwest scientists and millers working in conjunction with two or three Federal plant-hunters who knew the 5,000-year-old chart of its work in Asia.

Dr. Burlison was a graduate student at the University of Illinois when the soybean first caught his eye. Up to that time, one bulletin and one circular had been issued on soys as a "hard-time hay crop and soil-builder." Breeding experiments had just started at the state experimental station, to the unabashed "piffle" and "tsk" of some of the state's outstanding agriculturalists.

During the next decade, the soy had a succession of American step-fathers. Dr. W. J. Morse, of the U. S. Department of Agriculture, went to China and brought back new varieties. Dr. Burlison and co-workers discovered that soys when correctly handled can be made a soil-building crop and that the soy plant is immune to chinch bugs and dry weather. Finally, in 1928, H. J. Atwood, of Allied Mills, established an in-industrial market for the bean by contracting, with the support of the Funk Brothers Seed Co. and the Grange League Federation, for 50,000 acres of the year's crop at $1.45 per bushel. Add to this small list the Fouts Brothers Farm in Indiana, the Glenn McIlroy and Johnson Brothers farms

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in Ohio, the plant breeders and agronomists of Purdue, Ohio State, Wisconsin, Iowa and Missouri, plus the lean, prying figure of Henry Ford. Then salute the combine-harvester, and you have the step-daddies who turned the soy bean into a smash hit that has done more than any other single crop to bring Farm, Science and Industry to the same conference table.

"We still produce only half the vegetable oil and protein needed in this country," Dr. Burlison told me on the eve of Illinois' first Soybean Day on September 25. "We'll get competition, of course, from the coconut cow and other imports from the Orient. But the fact remains that the annual production of oilseed meals in the U. S. only totals 4,500,000 tons. We have an annual need of 10,000,000 tons for the efficient feeding of livestock alone."

Plains cattle, a swell as dairy herds, need protein to supplement their feeding through the winter months. More protein will mean better calves and a quicker response in the feed lots. It isn't too long a step from there to wonder if the soybean can cut down production costs to a point where the U. S. can compete with South American and Australian beef and veal in foreign markets. Plenty of the west's winter forage is down to 3% protein now. The soy averages out to 40% protein.

Carry beyond this to the prospects of the 17 leading varieties of edible soybeans in the fresh and canned vegetable field. These are just beginning to trickle into city markets, have yet to meet public acceptance. Edibles look and cook like limas, but with a nuttier flavor. Frozen, they will hold their goodness from September through May. Sugar content runs as high as 9%. Strangest of all the edibles is the Mung, now under experimental development by a large chop suey manufacturer on plots managed by J. E. Johnson near Champaign, Ill. The Mung is a shatterer and little larger than a pinhead, but it makes the best bean sprouts, will bring 6c a lb. dry and, when plant breeders have finished with it, is expected to yield up to 1,200 lbs. to the acre.

What then, is the future of the American soy? Admittedly, it is Agriculture's first big-time Chemurgic crop, supple enough to throw its surplus into a dozen different channels . . . as an animal food, a human food, a soil-builder or a commodity essential to a variety of industries.

Yet wise officials of the American Soybean Association realize that soybeans are in for some bumps sooner or later. A great deal of twirdle-wurdle has been written about soybean plastics and soybean wools. Officials of the U. S. Soybean Laboratory at

Urbana will, after closing their office doors, admit that they do not expect industrial consumption of soybean meal to go beyond 200,000,000 lbs. per year. This is just a little more than 2% of present meal production. The bulk of the bean's expansion then, it would seem, must come from new uses for the oil, bigger demand for the protein-rich human and animal foods.

Second great worry, as with every other crop, is Federal regulation. The soy has escaped AAA penalties so far because it is a legume and a soil-builder. Yet it has its defects here and its industrial enemies may make the most of these defects, politically, in the next few years in an attempt to check its spread.

Thirdly, there is the danger that science may overdo the job of stepping up production. Illinois, roughly producing one-half the beans grown in the U. S., has stepped yields up from 13.5 to 24.5 bu. per acre since 1925 through the introduction of its Illini and similar hybrid strains. Next year, the State Experiment Station will release seeds of the Chief, a still more potent strain. Yet 800 miles south in the flat black reaches of the Mississippi Delta, planters are chuckling over the yields of 45 and 50 bu. per acre on soybeans now planted between their cotton fields.

Dichloroethyl Ether Works for You

Condensed from Hog Breeder

THE air was heavy with the odor of ether, but instead of being surrounded by white hospital walls we were hemmed in by green walls of corn.

Down the long corridors of corn came men manipulating shiny hand oilers—the kind of pressure oil can associated with threshing rigs. At each hill of corn they touched the nozzle of the oiler to the silked tip of a corn ear, pressed the plunger, and went on to the next ear.

What we were witnessing was the first wholesale application to field corn of the new mineral oil-dichloroethyl ether method of killing a newer corn belt insect pest—the corn ear worm. Use of white mineral oil containing a 2 or 3 percent charge of dichloroethyl ether was worked out by scientists of the United States Department of Agriculture to control ear worms in southern sweet corn.

But the corn ear worm which

Reprinted by permission from the Hog Breeder, Chicago, Ill., Sept., 1941

yearly makes inroads on the quality and appearance of southern sweet corn and field corn in 1941 abandoned its geographical boundaries to invade the southern half of the corn belt proper. In some areas of southern Illinois infestation ran up to 100 percent. Many farmers were unaware of the extensive damage being done. And even if they were aware of the infestation there was little they could do about it.

With this in mind, scientists and crops men of the DeKalb Agricultural Association started experiments designed to work out practical application on a large scale. In all nearly 600 acres of corn were treated in "Egypt" where ear worm infestation has been unusually severe in 1941. The fields treated were located in White, Saline and Hamilton counties. Observation of treated fields a week after the application of the "shot" of mineral oil and ether showed that the corn ear worms, in various stages of development, had been stopped in their tracks by the lethal dose.

The oil - dichloroethyl ether treatment being administered by the DeKalb corn men was timed with the life cycle of the corn ear worm. The eggs that hatch out in the corn silk and do the damage as larvae are deposited by the parent moth. In the case of prevailing southerly winds the moths may be carried a hundred miles before they deposit fertile eggs. In three or four days the eggs in the corn silks hatch out into minute larvae and the small worms start feeding down the corn silks. As the worm works down it also increases in size. By the time it reaches the tip of the ear it is of a size to do considerable damage. It is before it reaches near maturity that the worm must be stopped by the oil and ether treatment.

However, the job of stopping it is not as simple as it might appear on the surface. The "shots" cannot be administered until the corn silks have been fertilized by the pollen from the tassel. Should treatment start before fertilization the eggs of the corn ear moth would be smothered by the oil—but fertilization would be prevented and barren ears result. In this case the treatment would be worse than the malady itself. So it is a matter of close observation in starting treatment after the corn has been fertilized but before the larvae work down in the silk too far.

The ideal period for treatment is just as the silks of the ear are showing a little brown. A quarter of a teaspoon of oil-ether shot on the silks at the tip of the ear in this stage of development will prevent the hatching of the more recently deposited eggs. This is due to the smothering effect of the white mineral oil. Worms in

various stages of development, apparently, are killed by the fumes of the ether itself.

Ears that were cut open at the tip eight days after treatment still bore the odor of ether. Also in evidence was the charge of oil protecting the silks. But more pleasing to the fighters of this newer corn belt pest were the deceased ear worms caught by the lethal dose in various stages of their destructive life cycle.

The 600 acres of corn involved in the large scale oil-ether treatment was covered by 100 men. Their rate of progress was one acre per day per man. Each of the men was equipped with the plunger type hand oiler. Anything showing silks was being treated—secondary ears as well as the fully formed ears. This was because of the high degree of infestation. Later, and farther north around Tuscola, Illinois, treatment was confined to the main ears. Here, however, the corn ear worms were fewer—an infestation of 10 to 40 percent.

By covering an acre a day and by "shooting" each silk showing it was estimated that each man was treating at least 10,000 ears a day. A peculiarity of the corn ear worm infestation makes it necessary that the control method achieve 100 percent effectiveness in each ear. For as George W. Barber, of the Federal Division of Cereal and Forage Insect Investigations, points out the killing of 99 out of 100 eggs or larvae is not enough. For one egg or larva remaining is the one to get. As the corn ear worms are cannibals and eat each other until only one remains within the ear anything less than 100 percent kill is no kill at all. For this reason the DeKalb men administering the shots saw to it that each ear got its proper dose of oil and ether.

Government reports on sweet corn treatment with oil and ether, and borne out by the DeKalb work on field corn, show that a very high degree of kill can be assured. Preliminary figures suggest a kill of 90 percent in fields so treated. The method is effective under all conditions of weather and control of the damage is obtained by a single application per ear. To insure that each ear, especially those with long, tight husks, gets its proper dosage from the oiler the government entomologists suggest that the spout of the oil can be fitted with a ¾ inch metal disc or washer about ½ inch from the end. This washer acts as a "depth gauge" so that the operator is sure of getting the worm killing charge deep enough into the silk end of the ear.

The Digestion of Poultry

From the Book, "Poultry"

A. R. Winter
Asst. Prof. Poultry Husbandry, University of Ohio
E. M. Funk
Asst. Prof. Poultry Husbandry, University of Missouri

DIGESTION is the disintegration of feedstuffs into simple nutrients in the intestinal tract for absorption and use by the body tissues. It involves a series of mechanical and chemical processes and is influenced by many factors.

Feed Intake and Storage. Feed is picked up in the beak of the fowl, moistened by the thick saliva in the mouth, and swallowed without mastication, since the bird is not provided with teeth. It passes down the gullet to the crop where it is stored until it can be ground, mixed with digestive juices, and digested. While in the crop, the feed becomes softened by the saliva swallowed with it and by the liquid secretions from the lining of the inner crop wall. The enzymes, present in the feed, result in a little predigestion of the carbohydrates. The crop contents develop a slightly acid reaction due to the formation of lactic acid.

It has been observed that when a bird is hungry, the first feed eaten passes directly to the gizzard. It has also been observed that a crop filled with whole grains is emptied quicker than one filled with ground grains, since the whole grains must be ground before they are ready for digestion.

Preparation of Feed for Digestion. The feed moves from the crop, a small quantity at a time, on down through the lower portion of the gullet and glandular stomach into the gizzard. Rhythmic-like contractions of the walls of the intestinal tract force the feed along through the tube. As the feed passes through the glandular stomach it stimulates the glandular cells in this region to secrete a gastric juice into the intestinal tract. This is a pepsin-hydrochloric acid mixture used for the digestion of proteins and for dissolving minerals.

The feed is thoroughly macerated and mixed with the gastric juice in the gizzard. Thorough grinding is necessary in order that the digestive juices may reach all parts of the material and digest as much of the nutrients as possible. The grinding is more thorough than in the case of most

Reprinted by permission from the book "Poultry"—published by Lippincott Co.

farm animals in spite of the fact that the bird does not have teeth.

One never finds whole grains and weed seeds in the feces from birds as is often the case in that from horses and cattle.

The feed is ground and mixed by slow, rhythmic rotary-like movements of the powerful muscles in the walls of the gizzard. The feed is squeezed between and rubbed over the rough washboard-like linings of the crop walls. Whole grains having been previously softened in the crop are easily macerated and pulverized in the process.

It is a common belief that hard insoluble grit is necessary, or at least desirable in the gizzard for the grinding process. Experimental evidence does not confirm the belief. In fact, the presence of hard insoluble grit and foreign material in the gizzard may take up valuable space and interfere with the grinding process and the passage of the ground feed.

Digestion of Carbohydrates. As the ground feed passes from the gizzard into the duodenal loop, pancreatic juice is secreted from the pancreas into this region of the intestinal tract. At the same time, alkaline bile salts, produced in the liver and stored in the gall bladder, are also secreted into the duodenal loop. The bile salts neutralize the acidity of the intestinal contents in this region of the intestine and produce an alkalinity. Three digestive enzymes are secreted in the pancreatic juice. One of these is amylase, which breaks down into disaccharides or complex sugars. As the food passes along into the small intestine, sucras and other sugar-splitting enzymes, secreted in this region further hydrolize or digest the compound sugars into simple sugars, chiefly glucose. Simple sugars are the end products of the digestion of carbohydrates.

Starches and sugars are easily digested by poultry, while pentosans and crude fiber are poorly digested. The intestinal tract in the chicken is so short and the passage of food through it is so rapid that bacteria have little time to work on the complex carbohydrates.

Digestion of Fats. The bile salts from the liver emulsify the fats in the duodenal loop. They are then acted upon by an enzyme, lipase, a product of the pancreatic juice. The fats are digested or broken down into fatty acids and glycerol. These are the end product of fat digestion. Fats are not very palatable or easily digested by poultry.

Digestion of Proteins. While the feed is being ground and mixed in the gizzard, the pepsin-hydrochloric acid mixture breaks some of the proteins down into less complex fractions as proteoses and peptones.

While fats and carbohydrates are being digested in the duodenal loop, trypsin from the pancreatic juice breaks down some of the proteoses and peptones into still simpler products—amino acids. Erepsin, secreted in the small intestine, completes the digestion of protein split products into amino acids. These are the end products of protein digestion.

Digestion of Minerals and Vitamins. Minerals are dissolved rather than digested. Many of them change from the solid to the liquid form in the gizzard. Oyster shell and limestone grit, for example, are dissolved in this region.

The digestion and metabolism of vitamins in the body are not well understood. Carotene, the precursor of vitamin A, is transformed into true vitamin A in the liver. The bird manufactures vitamin C from digested feed fragments in the body. Cholesterol in the skin is transformed into vitamin D by exposure to sunlight or ultraviolet light.

Rate of Digestion. Digestion is rapid in the chicken. The time required for food to pass from the mouth to the cloaca is about two and one half hours in a laying hen. The rate of passage is much slower (8 to 12 hours) in birds out of production.

Absorption of Nutrients. The digested nutrients pass through the intestinal wall into the blood stream. Most of the absorption takes place from the small intestine. The surface for absorption is greatly increased by the presence of innumerable villi or finger-like projections. These villi, which give the mucous membrane a velvety appearance, project toward the center of the lumen and thus come in intimate contact with the fluid contents.

With each villus is a lacteal, or drainage tube of the lymphatic system, and a network of capillaries of the blood system.

Digested nutrients in the form of simple sugars, amino acids, and dissolved minerals pass through the wall surface into the blood capillaries. The method or methods by which the materials pass through the intestinal wall are not well understood.

Digested fats pass through the intestinal wall into the lacteals of the lymphatic system. Here again, they form neutral fats. The fats in the lymph are more like body fat than like that of the feed eaten. The fats pass along with the lymph and enter the venous blood stream near the heart.

Transfer of Nutrients. The digested nutrients, entering the blood stream by way of the capillaries in the intestinal wall, are collected in the portal vein. It transports blood and the absorbed food nutrients to the liver, on their way to the heart.

As the digested nutrients pass

through the capillaries of the liver, most of the glucose is transformed into glycogen for storage in the liver and muscles. Some amino acids and nitrogenous products of tissue metabolism are de-amized as they pass through the liver. The carbohydrate fractions are made available for heat and energy purposes and the nitrogenous fractions are transported to the kidneys for elimination. The liver also removes some of the fat from the blood stream for storage. This accounts for the pale yellow livers in fat birds and newly hatched chicks. Many impurities absorbed from the intestinal tract into the blood stream are retained by the liver cells as the blood passes through its capillaries. In cases of absorbed poisons a high concentration of them is usually found in the liver.

The blood, carrying the digested nutrients passes from the liver by way of the hepatic and postcaval veins to the heart. It passes from the heart to the lungs where carbon dioxide and water are given off and oxygen is taken in. The blood is returned from the lungs to the heart, and is then pumped out through the arteries to all the tissues of the body.

The digested nutrients pass from the capillaries to the lymph which bathes the tissue cells. The lymph serves as a medium of exchange between the capillaries and the tissue cells. It carries digested food to the cells and waste products from them.

The Assimilation of Nutrients. Glucose is burned in the cells for heat and energy production, the end products being heat or energy, carbon dioxide, and water. An excess of digested carbohydrates, over and above that stored as glycogen, is transformed into body and egg fat.

Fats are gradually removed from the blood stream and stored as adipose tissue mainly under the skin in the abdominal region, along the intestines, and in the egg. They serve as a reserve supply of heat and energy. In case of inadequate food supply, as soon as the glycogen is used up, the fats are burned with the same end products as formed by the burning of carbohydrates. As long as fats are present, the proteins are protected from consumption.

Amino Acids, absorbed into the blood stream, are used to build new body tissues, rebuild worn out tissues, and to form the white and much of the yolk of eggs. Excess amino acids may be used for heat and energy purposes or transformed into fats. The carbohydrates and fats are preferable to proteins for the production of heat and energy because they are cheaper. Their digestion and metabolism, including the excretion of the resulting waste products, require less work on the part of the body than is required

by protein food. Experiments show that carbohydrates are more efficient protein sparers than fats, even though the latter have a greater energy content.

Minerals absorbed into the blood stream are transformed into bone, put into the shell and yolk of the egg, and used in the blood. There is also some storage of excess minerals taken into the body.

Vitamins are stored in the liver and in the egg, and to a lesser extent in other tissues of the body. There appears to be greater storage of the fat-soluble than the water-soluble vitamins.

REVIEW

POULTRY by A. R. Winter, Asst. Prof. of Poultry Husbandry at Ohio State University, and E. M. Funk, Asst. Prof. of Poultry Husbandry at Missouri State University (J. B. Lippincott Co., $3.50), should be found on every poultryman's shelf. Recently published, it contains all the newest information on the care and feeding of chickens, turkeys, ducks, and geese. There are a few paragraphs on pigeons, guineas, peafowls, swans, and game birds. The analyses of feeds, and the best methods of using them are carefully described, as well as all the matters relative to poultry production. The book is clearly written, and easily understood, and will be of great help to the poultry producer.

The Nittany Turkey

Condensed from Pennsylvania Farmer

H. C. Knandel

THE grandparents of the Nittany turkey (the eastern wild turkey) once inhabited the mountainous area of Pennsylvania when the Indian was master of all he surveyed. By improved methods of selection, breeding and management at The Pennsylvania State College since 1931 the native wild turkey of Pennsylvania has been transformed into a stream-lined, compact, efficient fowl. The word Nittany was given to this particular variety of turkey because the original stock roams through the tree-covered mountainous area of central Pennsylvania of which the Nittany range of mountains is a prominent part.

America can feel proud in the fact that the Great American Bird—the turkey—is a native of this country. Four general varieties of the wild turkey may be observed in four sections of the

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United States. In southern Florida may be found the Florida wild turkey; in southern Texas and northern Mexico, the Rio Grande wild turkey; in the mountains of Arizona, southern Colorado and western New Mexico, the Mexican wild turkey, and in eastern United States, the Eastern wild turkey.

The wild turkey of Mexico was classed with the pheasant, which is a native of India. In the Famil language of India, the word "toka" means peacock, while the primitive meaning of "toka" refers to a train or trailing skirt. After the discovery of the New World, wild turkeys were introduced from Mexico into Spain. Here they were handled by the Hebrew merchants who in 1520 were very numerous in Spain.

Because of the similarity between the peacock and the turkey the Jews gave the new fowl the name of "tukki." Since the Hebrews were much interested in rarities, and the turkey at that time was a rare specimen, great financial profits were received by the Jews in dealing with these birds. Thus the word "tukki" was heard throughout the market places of Spain. Later the fowl was domesticated and introduced into Europe from where it found its way back to the western hemisphere.

No great progress in rearing and maintaining turkeys was made for many, many years. In fact, from 1890 to 1920 the turkey population declined 65 per cent in the United States. Turkeys had become scarce and high in price. If the turkey was not to become extinct improved methods of propagation must be developed. And so in the late 1920's turkey investigations in propagation, nutrition, breeding and management were started at a few of the agricultural colleges in the United States. By 1932 the number of turkeys reported on farms in the United States by the Department of Agriculture had reached the staggering total of more than 18 million—almost a 600 per cent increase over the number reported in 1920.

In 1934 the U. S. Department of Agriculture, Bureau of Agricultural Economics, made a survey of the turkey industry in the United States. This survey revealed the fact that small turkeys were scarce and in demand because the average family buyer preferred the small turkey.

For several years prior to this time the Department of Poultry Husbandry at The Pennsylvania State College had been investigating the artificial propagation of the eastern wild turkey which finally, in 1931, became the Nittany turkey. The scope of the investigations was enlarged in view of the survey by the U. S. Department of Agriculture and in-

cluded studies in nutrition, breeding, marketing and management. Over a period of 10 years, selections have been made to develop a turkey in size and color pattern similar to the wild turkey, but with a more docile temperament, higher egg production, greater reproductive powers and a more compact carcass.

The following table shows the weights of the Nittany turkey compared to the Bronze and White Holland varieties:

Weights of Female Turkeys

Variety	Young Lbs.	Yearling Lbs.	Adult Lbs.
Nittany	10	11	12
Bronze	16	18	20
White Holland	14	16	18

Weights of Male Turkeys

Variety	Young Lbs.	Yearling Lbs.	Adult Lbs.
Nittany	14	17	20
Bronze	25	33	36
White Holland	23	30	33

For the average-sized American family the Nittany turkey is preferred. Hot roast turkey is delicious, cold roast turkey is a choice morsel the second day. Even turkey soup is relished the third day, but to serve turkey in any form more than three consecutive days is not conducive to increased turkey consumption. Turkey growers cannot expect to sell small-sized families an 18 to 30-pound turkey and hope to receive repeat orders.

The plumage pattern of the Nittany turkey resembles that of the wild turkey and presents a most gorgeous sight as the sun's rays strike the predominating copperish bronze coloring.

Questions are often raised regarding the behavior of the Nittany turkey. Must they be confined to prevent their escape? Do they eat the same feed as other varieties of turkeys? Can they be managed similarly as the Bronze and White Holland varieties? Do they produce and reproduce freely? How much feed is required to produce a pound of gain? Answers to these questions and many more have been found during the past 10 years of investigations.

The Nittany turkey can be successfully raised in total confinement, in semi-confinement or on free range. If range is provided, a good plan is to fence the area set aside for the turkeys so that predatory animals may not take a heavy toll. Mash, grain and plenty of fresh water should always be available thus encouraging the birds to stay in their rightful place. Turkeys will not fly over even a three-foot fence if they are provided with a complete ration.

The Fowl Leukosis Battle

Condensed from Farm Science Reporter

C. D. Lee and A. J. G. Maw
Iowa State College

A few years ago, chickens were dying right and left on farms with a disease called range paralysis, fowl paralysis and various technical names. At that time we little understood the disease—its cause or what to do about it. Probably in the last 10 years this disease has caused more losses to the poultry raiser than any other single disease of adult poultry.

In order that we might study the disease, find its cause, the method by which it was transmitted from one bird to another and what to do to cure or prevent it, we bought an entire flock that was badly infested with the disease. This flock was taken to the Poultry Research Farm of Iowa State College.

We soon discovered that the disease showed up not only as paralysis of the legs, wings or internal organs, but in various other forms. Some of these other forms affected the eyes (sometimes complete blindness), tumors in various parts of the body, a sort of anemia infection of the marrow of the bones.

It is obvious that to call this disease range paralysis or fowl paralysis isn't satisfactory, for a bird suffering from the disease may be able to transmit it on to other members of the flock and still not be paralyzed. So to work out a nomenclature for the disease as a whole, a group of poultry pathologists met at the Regional Poultry Disease Laboratory at East Lansing, Mich., last summer and adopted the following nomenclature:

Fowl Leukosis Complex

1. Lymphomatosis
   - Ocular (eye type)
   - Neural (paralysis)
   - Visceral (tumor infiltrations)
   - Osteopetrotic (enlarged bones)
2. Erythroleukosis
3. Myeloid leukosis

We found that infected material taken from a bird affected with one type of leukosis injected into susceptible birds might produce any of the other types.

Fowl leukosis is an infectious disease caused by a filterable virus.

The disease is highly infectious, spreading readily within a flock.

It usually strikes birds between 4 and 8 months of age and most often around 6 months. Birds of all breeds are affected, and no recoveries from the disease have been noted, but temporary let-ups do occur.

Going back to the flock which we purchased about 12 years ago for study of the disease—we trap-nested the layers to keep track of them. We made some matings the first year, and part of the chicks were inoculated with leukosis virus, while control lots from the same matings were not inoculated.

In this first year of our study, the control chicks which received no virus came down about as badly with leukosis as the birds injected with the virus.

Then we began to notice fewer of the chicks from certain families died—the chicks from certain hens seemed more resistant than others.

With this lead we continued our breeding to see whether or not careful selection and breeding could conquer the disease. Now after about 10 years of breeding we have certain strains or families that are 95 percent resistant to leukosis, and other strains of which 40 to 100 percent will die when inoculated with the leukosis virus.

It is our observation that practically all flocks have some leukosis.

We have come to the conclusion that the breeder or hatchery operator who follows a thorough practice of culling and breeding can control the disease. Here is the schedule he needs to follow:

Cull several times a year, removing at each culling all birds that have gray eyes and those that are light in weight or have pale combs. Obviously, any that are paralyzed in the wings or are lame should be removed.

The control program may be speeded up by using as many 2-year-old hens in breeding flocks as possible. In using 2-year-old birds, care must be taken in control of other diseases, as tuberculosis.

The eyes, weight of the birds and comb color are about the only obvious symptoms of the disease. By continually removing these birds showing infection (these infected birds have had an opportunity to pass the disease on to the other members of the flock), you will be saving as breeders the birds that have stood up and showed resistance to the disease. The more frequently the flocks are culled, the better the results will be.

Such careful culling and selection will bring another indirect benefit—it gets rid of the low producers, and better chicks will be turned out.

About the various forms in which fowl leukosis appears, we

have made the following observations.

Neural

Neural is the nerve type. Paralysis in these birds may be general or local. Paralysis of one or both legs, or one or both wings may occur. The paralysis may be slight or so severe that the bird is practically helpless.

When the brain is involved, various symptoms may show as well as abnormal head movements. Some of these may be a waving motion of the head, throwing the head backwards or the beak downward, lateral movements and, in general, a lack of ability to hold the head in a normal position.

Many cases show a paralysis of the internal organs. In some cases the nerve of the neck is affected and the bird has difficulty in breathing. It may breathe through its mouth. The disease may strike suddenly or it may come on gradually.

Ocular

In the eye cases the iris or red portion of the eye frequently shows in the beginning a depigmented circle around the pupil. The circle is gray at first or may be only a slightly faded color, but gradually extends until the red or bay color is almost completely replaced. The process may start in any part of the iris as a small depigmented spot, or it may start as a generalized depigmented process throughout the iris, characterized as a faded gray appearance.

In many birds the depigmentation appears to start in several places in the iris at the same time, giving the appearance of a normal bay color, interspersed with faded or gray areas.

Often the depigmentation is irregular and has a streaked appearance, mingling the bay color with gray. The color changes may vary from a faded bay to a dark or light gray, bluish gray or slate gray. In some cases a black colored tissue appears as a multiple tumorous mass. Generally both eyes are involved, with one appearing more severely affected than the other.

Many cases show involvement of only one eye. In a high percentage of cases regular or irregular constriction of the pupil occurs with impaired vision or even blindness. The condition may spread rapidly or slowly, and in many cases it appears that the disease has become arrested. The birds usually remain in good health unless blindness occurs or unless the eye type cases become complicated with other forms of the disease.

Frequently we have observed birds with uncomplicated eye cases in the beginning which developed some other type eventually. We have also seen several

uncomplicated eye cases that have lived 2 years without any great impairment of health.

While most of the popular breeds of chickens should have normally a reddish bay colored iris, some do not have. The iris of the Cornish, and some game birds, is normally a yellow or pearl color, and many crosses of this breed may have normally pearl or gray eyes.

Visceral

Clinical symptoms in cases affected with lymphocytoma tumors and tumor-like infiltrations in various organs vary greatly, depending upon the tissues or organs involved. Many cases in good flesh have died suddenly and upon autopsy were found to be suffering from an enormously enlarged liver.

Respiratory difficulty was observed in a few cases which upon autopsy showed an involvement of the lungs by lymphocytomatosis (tumors). The symptoms in general are more obscure than in the other types of the disease.

Erythroleukosis

Many degrees of affection are noted in the erythroid type. The most characteristic symptom is a severe paleness with a definite yellow discoloration of the skin of the face. The tendency in most of these cases is toward "going light."

The course of the disease is also variable, in some cases progressing rapidly and in others slowly. The appetite usually remains normal except in the very acute, generalized cases and in cases of prostrated birds.

Myeloid Leukosis

The clinical manifestations of myeloid leukosis are widely variable. The onset may be gradual or rapid and general weakness with diarrhea is quite common. The skin, comb and wattles may not show any color changes, while some birds show varying degrees of paleness as well as a peculiar pallor. The tendency in these cases is toward a rather rapid emaciation.

In order to seek an answer for this question, we made matings of paralyzed birds but with very little success because of lack of production or fertility. Birds suffering from erythroleukosis or myeloid leukosis rarely produce eggs. In cases of ocular type or eye type, birds may produce normally with a normal degree of fertility. Matings were made of iritis females and iritis males. The birds were hatched and placed in isolated colony houses. During a 12-month period 65 percent of these birds died of some form of the fowl paralysis complex. Matings were made of iritis females and normal males and about 50 percent of these birds died of the complex. Mat-

ings of normal females with an iritis male were used and about 16 percent of the chicks hatched of this mating died of fowl leukosis.

To further this investigation, blood from day old chicks hatched from a mating of iritis females and males, was injected into 1-week-old susceptible stock from our own breeding flocks. These inoculations resulted in a 60 percent mortality from some form of fowl leukosis during a 12-month period. These experiments were repeated using blood from 1-week-old chicks from iritis matings and at weekly intervals for 12 weeks. We found the blood to be infective at about all ages.

Control Methods

A rigid culling program eliminating all birds with faded gray eyes, light colored comb and wattles, lame or paralyzed birds, and extremely light birds, will eliminate carriers, thus greatly decreasing this disease in the flock.

When the disease becomes prevalent the above procedures should be followed and the birds surviving kept as a source of resistant breeding stock.

In only extreme cases should a flock be disposed of and new birds brought on the farm as they will, in most instances, be very susceptible to the disease, whose infective agent is already present on the premises.

How To Choose a Farm

Condensed from The Nebraska Farmer

Dr. F. D. Keim
Chairman of the Agronomy Department, Nebraska College of Agriculture

MANY prospective land buyers want to know how to choose a farm.

One should probably first consider the type of farming enterprise in which the buyer is interested. Some like ranching, general livestock farming or specialized dairying. Others like truck farming or fruit growing, while still others prefer "suit case" grain farming. The farmer's likes and dislikes, as well as the climate, the soil, and the topography of the region under consideration, are important factors in making the choice of a farm.

After the decision is made on the type of farm, it always pays to study carefully a number of things that may spell the difference between success or failure. Abundant information is available in your agricultural college archives.

It is not wise to buy a farm just because a land salesman tries to sell it to you. Every honest

Reprinted by permission from the Nebraska Farmer, October 18, 1941

salesman enjoys a little sales resistance. One should buy such an important piece of property only after obtaining additional information from those who are not going to make a sales commission out of the deal. Before you sign on the dotted line consult the local banker. Find out from several good loan agencies how much money they will loan per acre on this particular farm. The local county agricultural agent and several long-time farmers in the community should be interviewed. These interviews give the buyer a chance to study and reach a mature decision.

It usually is not wise to bite off too large a piece. Avoid excessive debt. One "old timer" told me that he never bought any additional land unless he had enough to pay down, so that he did not have to mortgage the land which he already owned. This advice, if it had been followed during our last big land boom, would have saved many bad headaches as well as heartaches. The "old timer" mentioned that he saw his land decrease in value but he did not lose an acre of it. The old pioneer could buy land and be reasonably sure that it would increase in value. Today land should be purchased on the basis of the amount of income it will produce.

A good water supply is necessary. It should not only be good from a taste standpoint, but should be available in quantity. A good well and a flowing stream that does not overflow are ideal. The depth of the well and the seasonal flow should be one of the first questions settled by a livestock farmer. The Conservation and Survey Division of the University have maps that show the water supply of almost every section of land in Nebraska. This information is available for the asking.

Before signing on the dotted line the prospective buyer should examine the land for noxious weeds. On a farm infested with bad perennials, such as bindweed, perennial smart weed, white weed, perennial peppergrass, or leafy spurge, it will cost at least $10 per acre to eradicate these pests. The time and extra effort that this takes is not a small item. The summer or fall is much better than winter or early spring to observe weed infestation.

There is much advantage in a good location. The distance from a good town and the condition of the road is something that should not be overlooked. A farmer and his family travel many hundreds of miles every year to and from town. Anyone who has lived on a dirt road and plowed through mud when taking his products to market really appreciates a graveled or surfaced road.

Community, the type of neighbors, and the accessibility of the neighborhood to church and school, all have a bearing on the happiness and family life of a farmer.

Another location suggestion should be made from a tax standpoint. Regular real estate taxes should be investigated. Many times special taxes, such as drainage, irrigation, school, and other taxes become a burden that is difficult to overcome.

Good improvements are essential to any farm. Too elaborate improvements can become a burden. Let us not forget that buildings require upkeep. A fair-sized house, modern if possible, and just enough buildings to properly house the farmer's livestock and machinery are all that are necessary. The arrangement of farm buildings and the condition of the fences should not be overlooked. Fencing is not a small item, and many farms that are on the market have very poor fences. I mention this because it has a bearing on the price one should pay.

Be sure you do not pay too much for a farm. Your ability to make a decent rate of interest on money invested depends in part on the amount you invest per acre. The good merchant must buy right as well as sell right. This applies also to the farm. If you pay a reasonable price, the land with proper management should be a good investment.

Agricultural statistics on the productivity of all farms in a community are available. The prospective buyer can obtain from the former owner the average yields of all crops grown on the farm. All of this information is on file in the various county A.C.P. offices. From this he can figure fairly accurately the income and thus arrive at a fair value. Much research has been done on correlating crop yields with soil types. Land use maps and soil maps are available in every county if the buyer will take the trouble to obtain them.

The appearance of farm improvements are reasonably accurate in distinguishing good farming communities. There are always some exceptions and these can be and should be checked. Beware of a farm in a good community that changes hands too frequently. It might just happen but land sometime is very variable and one should be sure that nothing is seriously wrong.

Naturally climate is an important factor. Most farmers have seen the tremendous importance of abundant rainfall, or should I say the lack of it, the past eight years. The rate of evaporation should be considered as well as the rainfall. Where temperatures become very warm and wind velocities are high much of the

rainfall is evaporated. Information on rainfall and other climatic factors is common knowledge and should be carefully studied.

Soils differ in productivity. The soils of Nebraska, as well as all other states, have been rated and classified in regard to total yields of crops that are likely to be produced. They have also been classified as to crop preference, such as wheat soils and corn soils. One should know if a farm has been derived from glacial material, or from wind-blown materials such as the loess. In most states loess is considered the best. Whether a soil is made up mostly of clay, medium clay, or sand is important. The depth of the surface soil is a great factor. No one wants a farm located on land that contains six inches of black dirt and then gravel from there on down to China. Such land has some value as pasture, but will never consistently grow good grain or feed crops.

A prospective buyer, unless he knows exactly what he is buying, should always go over the farm with a soil auger or a spade. Most all counties have detailed soil survey maps. If you can not get one from your congressman you can always find a copy in the county agricultural agent's office or in the office of the Soil Conservation Service district. The various soil series have different productive values. Find out the name of the soil series that is located on the farm in which you are interested, and then discuss the value of this soil with someone who has made a study of soil classification. This sounds like a lot of detail but it is important.

Topography should be taken into consideration. Rough broken land has value but the land-use capabilities differ widely from good, level land. Rough, hilly land always possesses an erosion hazard that is avoided on smooth land.

I remember looking at a very good farm in one of our eastern counties a few years ago. It was rather rough but the growing crop was excellent and the land appeared to be very fertile. I took occasion to drive around the section looking for drainage difficulties and noxious weeds. To my surprise the farm to the north had almost washed away. Gullies and subsoil outcrops were everywhere. Originally the soil type was the same on both farms. The good farm was managed properly; the poor one had received no thoughtful care. Some of us, of course, must live on rough land, but the above illustration shows that more care must be given to rough land, and this should be thoroughly understood by the prospective buyer.

County soil survey maps are available. Many counties have land-use maps.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Electricity in the Home and on the Farm, by Forrest B. Wright ($2.75). Published by John Wiley and Sons, Inc.
(See Farmers Digest, November, 1941)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Forestry in Farm Management—By R. H. Westveld, and Ralph H. Peck, John Wiley and Sons, Inc. $3.00.
(See Farmers Digest, September 1941)

Fruit Crops—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.
(See Farmers Digest, June, 1941)

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Review. $2.50.
(See Farmers Digest, October, 1941)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $3.50.
(See Farmers Digest, November, 1941)

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

Plant Ecology—By W. B. McDougall, Regional Biologist, Santa Fe, New Mexico. Lea and Febiger. $3.00.

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUG. 24, 1912, AND MARCH 3, 1933
of the Farmers Digest, published monthly at Ambler, Penna. for October 1, 1941

State of Pennsylvania | ss
County of Montgomery |

Before me, a Notary Public in and for the State and County aforesaid, personally appeared L. Bush-Brown, who, having been duly sworn according to law, deposes and says that he is the Editor of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the editor, L. Bush-Brown, Ambler, Pa., business manager, A. E. Heick, Ambler, Pa. 2. That the owners are Farmers Digest, incorporated, Ambler, Pa., L. Bush-Brown, Ambler, Penna. C. Leavitt Dyer, New Hope, Penna.; A. E. Heick, Ambler, Penna.
3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, L. Bush-Brown, Editor. Sworn to and subscribed before me this 25th day of September, 1941 (Seal). I. K. B. Hansell, Notary Public. (My commission expires March 25, 1945.)

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Scholarship Prize Contests

To 4-H Club Boys

The Farmers Digest is offering a one hundred dollar ($100) scholarship to the winner of the 4-H Club Prize Contest.

This contest is open only to boys who are members of a 4-H Club and who will graduate from high school by July 1, 1942.

The contest closes January 1, 1942.

For complete contest rules refer to recent issues of the Farmers Digest.

To F. F. A. Boys

The last Prize Scholarship Contest sponsored by the Farmers Digest was open to F. F. A. boys and was won by Dean Parish, Manteca Union High School, Manteca, California.

The current contest, which closes January 1, is open to 4-H Club boys. The next contest will be open to F. F. A. boys.

Watch for Details!

Perhaps you will be the winner!